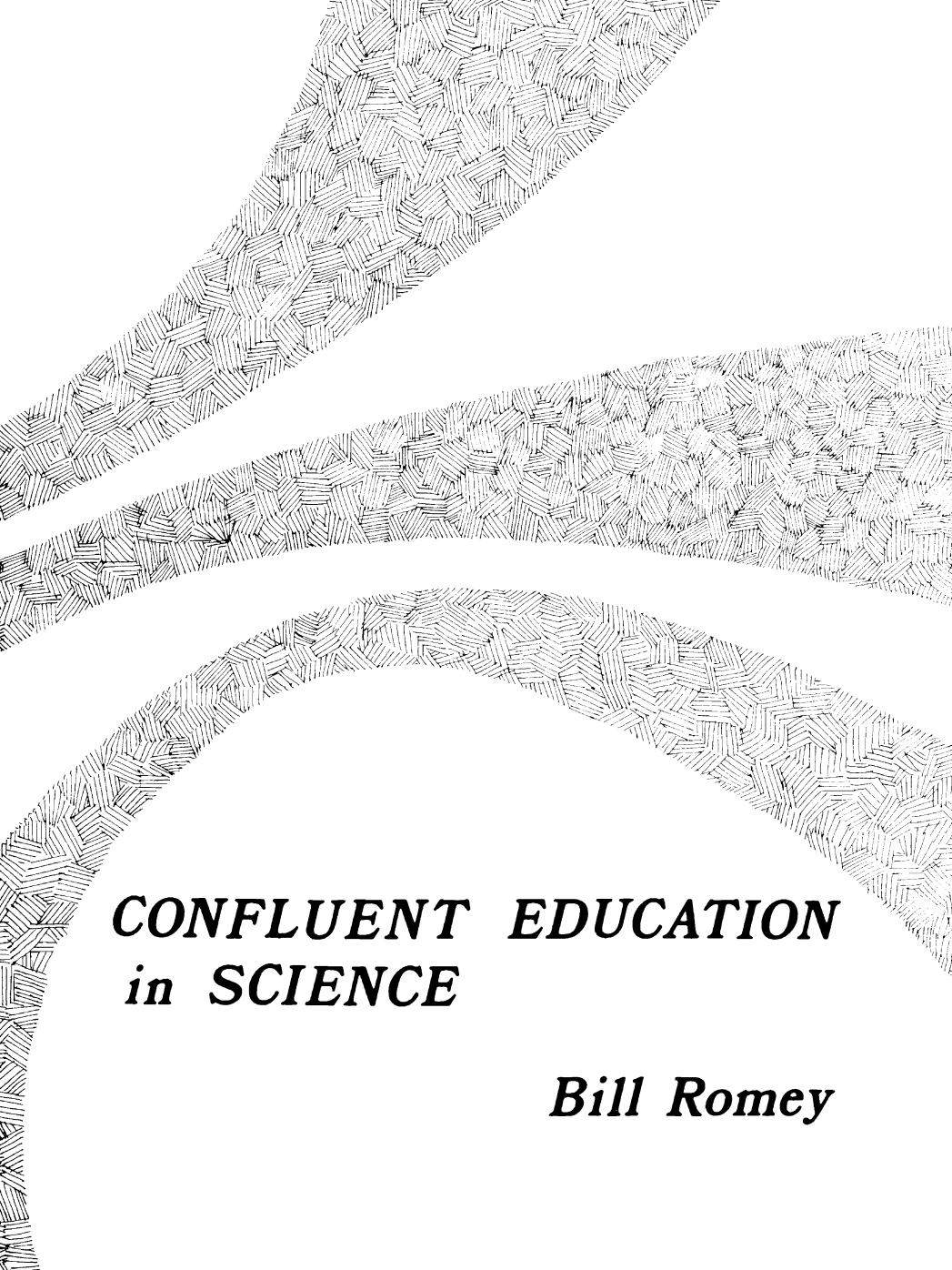

CONFLUENT EDUCATION in SCIENCE

Bill Romey

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by

Bill Romey

with drawings by Lucretia Romey

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Dedicated to the people from St. Lawrence University, both those whose names I have mentioned and left unmentioned, who are the essence of this book.

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PREFACE

In 1969 George I. Brown completed a book entitled *Human Teaching for Human Learning: an introduction to confluent education*. By "confluent education" he meant education in which both affective (emotional) and cognitive (knowledge-related) aspects are integrated or flow together. This encompasses the broad areas of what has also been called "humanistic education" by many recent writers.

In the present book I want to explore Brown's notion of confluence in the area of science education. I will expand this notion somewhat in that I believe the word "confluence" lends itself also, admirably, to the flowing together of subject matters normally confined to "disciplines" and labeled "science", "language arts", "humanities", "art", etc. Even though my emphasis will be on the area called "science", I will emphasize how I see this area flowing into other areas in the direction of an ultimate transcendence of the discipline.

By way of introduction I want to describe briefly my own access routes into a confluent mode of education. In 1962, the science education group at Syracuse University hired me as a person trained primarily in science to develop a program for teachers of earth science and general science. At the same time, Marvin Druger, a research-oriented geneticist who also had strong interests in pre-college education, was hired to strengthen a previously existing program for biology teachers. Marvin and I had had little or no formal training in "professional education" as such. The education faculty, in confirming our positions as members of their faculty, expressed the expectation that we would, with their help, "retread" ourselves as bona-fide education-school people. The science faculty members meanwhile expressed their expectation that we would remain true to the sciences and help the "educationists" see the true light.

Marvin and I began our schizophrenic careers as scientist-science educators. We developed associations in both circles, maintained two offices each, participated in two sets of department meetings, and taught courses in two different colleges of the university. Through the school of life experience and through the help we received from many secondary and elementary teachers, we began to learn about problems of secondary and elementary school science. I became a participant and ultimately a full-time staff member (1969-72) of The Earth Science Curriculum Project (ESCP) and its successors, The Earth Science Teacher Preparation Project (ESTPP) and Environmental Studies for Urban Youth (ES). Matters of content, curriculum, method, learning, people, and psychology melded together.

These experiences have convinced me that education is primarily a process of change and growth and that the teacher must continue to experiment, change and grow, too, if he or she is to be a dynamic force in helping other people learn.

As I worked with science teaching methods courses I drew together a manual for use by students. I had only started following some of the literature in educational psychology and methods, and so this book developed as a gut-level approach to what I saw working in classrooms and how I felt that students and teachers might grow to have better learning experiences.

Because I felt that growth in teachers came from a constant searching for better ways, I came to call the developing manuscript "Searching for a Style of Teaching Science." Prentice-Hall, the publisher, decided that *Inquiry Techniques for Teaching Science* would be better for their sales. I agreed that it sounded all right - because inquiry *was* an "in" thing at the time. In addition, searching for my own style at that time did center around "discovery", "activity" and "inquiry" approaches, and the book reflected my preoccupation with that range of styles.

Soon after *Inquiry Techniques for Teaching Science* came out, David Ost pointed out that I had omitted specific mention of the affective domain as a factor in science classrooms. I had made the assumption that affective (emotional, feeling-level) concerns flowed along naturally as people learned the cognitive elements of science that many people think of as the basic reason for schooling. In two more recent books, *Risk-Trust-Love: Learning in a Humane Environment* (Charles Merrill Co., Columbus, Ohio, 1972), and *Consciousness and Creativity: transcending science, humanities, and the arts* (Ash Lad Press, Canton, N. Y., 1975), I have tried to address that missing dimension.

During my time with ESCP, ESTPP, and ES, and for the past four years at St. Lawrence University, I have become involved in working toward more confluent and transdisciplinary approaches to learning. Our groups have developed a number of useful insights about the nature of confluent education and how it can be facilitated. Some of these have been described by others as "methods" or "techniques". I am not comfortable with the idea of "techniques". I am more concerned with what the teacher *is* than with what he does. I still have some ways of doing things, however, and I have been urged to put these down. I caution you, however, not to get into method for its own sake. An analogy to the "method" acting techniques of Constantine Stanislavskiy will perhaps serve to emphasize this. In this "technique" the actor attempts truly to *become* the character he plays. No externally suggested tricks embellish the characterization. The actor must do as the character would do in situations that become *real* for him. The director, as I learned from George Marchi at the University of California in Berkeley, does not show the actors what to do or how to do it. Instead he and all of the other actors help each actor develop his or her own sense of the *person* he or she plays. The "method", then, is not a method at all; it is a *way of being*.

In this book I will assume that the reader is already basically sympathetic to what has been labeled "open education" or "humanistic education" and is seeking means of implementing environments that foster a highly learner-centered learning situation. I take

the basic assumptions and assertions I shall state in the first part of the book as articles of faith, as basic paradigms for learning and beliefs about the nature of the person. People who do not share these articles of faith will probably not find this book useful and may find that its contents threaten their beliefs. Such is the nature of belief. Belief is basically "irrational" when viewed from an outsider's perspective. Adoption of belief occurs by conversion rather than by recourse to "proof", if we are to believe what T. S. Kuhn states in *The Structure of Scientific Revolutions*.

I intend this as a practical manual for people who wish to implement or work within or toward confluent learning environments. This includes people who would be labeled "students", "teachers", "administrators", etc. in conventional schools. In an ideally functioning confluent learning environment these distinctions might cease to exist, for all participants would serve as learners, teachers, custodians, and administrators. While the transition from regular schools to confluent learning environments is taking place, people continue dominantly to play one role or another.

Students, you may find the book useful in helping to deal with the ambiguity of an open situation. How can you best take advantage of the resources? What do you do if you want to develop a good learning experience? How do you "get" motivated?

Teachers, how do you cope with the provision of resources to people working in a thousand different directions? How can you be effective helpers? How do you help people find motivation and then *move*? How do you retain your own freedom? How do you avoid sheer exhaustion? There are some triggers and gimmicks that may help you help yourselves and help others.

Administrators, how do you deal with what may at first appear to be chaos? How about interfaces with faculty who have other beliefs about education, with parents, school boards, trustees, other administrators? Perhaps this book will help you to understand, to help, and to participate, too.

I should emphasize that the practice of confluent modes of education does not require an "open" school. Confluent modes represent a group of attitudes about how learning occurs and can best be facilitated rather than a mode of *organization* of the school program. Some so-called "open" schools are not humanistic at all and involve teachers and administrators who do not practice confluent education. Some very conventional-appearing schools, on the other hand, have within them teachers and administrators who provide a highly confluent environment. The heart of the matter, then, is in the person-to-person relationships within the school rather than in the external *forms* one sees within the school. For this reason, I plead that you not look at the gimmicks and methods within this book as a sure route to a confluent environment. The ideas I present are meant to help provide ideas, to suggest routes for exploring new ways of operating, to set up challenges to value systems and beliefs in hope that you will be stimulated to grow. The basic problem is *being*, however: how you *are*, how I *am*, and not what we *do*.

Most of this book was written at about the same time as *Consciousness and Creativity: transcending science, humanities, and the arts* (Ash Lad Press, 1975). These two books can be looked at as companion volumes. *Consciousness and Creativity* is somewhat more philosophical in its approach. *Confluent Education in Science* is intended as a more practical guide, specifically for science teachers.

A NOTE ON ALPHABET SOUP

Many recent experiments in science education and in other areas have received acronyms that reduce their ponderous names to a few letters. These designations provide a convenient means of abbreviating and simplifying communication for people regularly involved in the area. For people who do not follow the specialists, the acronyms often cause confusion. Many people come to cherish and value the science education acronyms as having lives and personalities all their own which are actually spoiled by having to spell out the whole title. I will use these acronyms frequently, because they do have this special quality for me. When I say "Earth Science Curriculum Project" instead of ESCP, I feel the same way I do when I call my elder daughter "Catherine Louise" instead of Cricket. ESCP is an old friend, whose nickname I savor and enjoy.

In the interest of communication, I provide this list of acronyms and their full names. Please look back to this page if you wish to identify a group you may not be familiar with.

BSCS -- Biological Sciences Curriculum Study

CBA -- Chemical Bond Approach Project

CHEM Study -- Chemical Education Materials Study

ECCP -- Engineering Concepts Curriculum Project

ESCP -- Earth Science Curriculum Project

ES -- Environmental Studies for Urban Youth

ESS -- Elementary Science Study

HSGP -- High School Geography Project

HSP -- Human Sciences Program

IPS -- Introductory Physical Science

ISCS -- Intermediate Science Curriculum Study

ISIS -- Individualized Science Instructional System

MACOS -- Man: A Course of Study Course

PPC -- Project Physics Course

PSSC -- Physical Science Study Committee

SAPA -- Science - A Process Approach

SCIS -- Science Curriculum Improvement Study

SMSG -- School Mathematics Study Group

PRIMARY ASSUMPTIONS ABOUT HUMAN POTENTIAL, MOTIVATION AND LEARNING

Three primary assumptions need mention in this opening chapter. The first deals with the nature of human potential, the second with motivation, and the third with the nature of learning.

I have a deep conviction that every person is full of enormous and largely untapped human potential. Too often, education is viewed as wrapping people up and labeling them: "one year's credit in science, two years' credit in math, high school graduate, B.A., Ph.D." To me the job of education is not to "create" an educated person but to unwrap and free the potential that is already there within the person. In that way only can each person grow in his or her own way and develop his or her unique potential in a maximum way. Mainly the job is to keep out of the way of natural development rather than inhibiting, constraining, or trying to shape it.

If this underlying assumption about human potential is true, then the teacher's job becomes one of providing all of the access routes he or she can think of. Then the teacher must learn to stand back and let people grow without interference. I want to be available to work with people as they seek me out. But I do not wish to impose any scheme of learning or special body of content upon them.

Before this great human potential can be released a person also must possess a self-concept that allows him to trust his own organism. Thus, trying to provide conditions in which enhancement of self-concept occurs also becomes an essential task.

The nature of motivation is a second factor about which psychologists and educators argue a great deal. Rogers and other psychologists have dealt with problems of working with unmotivated clients in psychotherapy. In education we are frequently confronted with unmotivated students as well. This is perhaps especially true in the sciences where many (the majority of?) students are enrolled as a result of requirements rather than choice.

In elementary school, you do science when it is science time. In junior high school and high school you have a certain amount of science required. In the state of Indiana when I was in high school all students were required to have a year of biology to graduate. I had a negative experience and purposely avoided all other science during high school. Most colleges require at least some science.

I have often worked over the past few years with students who are present to fulfill a requirement. I find myself confronted every year with a new group of people, many of whom would choose to be elsewhere. Last year I told a group of one hundred fifty students at our first meeting that I would give credit right away, with no further participation required, to any person who wished. To my disappointment, no one came forward. Some did in a tacit way by delaying the actual "confession of no involvement" until the end of the term. I accepted this lack of involvement and made no value judgments. As far as I am concerned I see no reason for an unmotivated person to participate in a science course any more than I see a reason for him to drop stones on his foot three times a week. Science is not necessarily "good for you" so you "have to take it."

In psychotherapy, Rogers advances the notion that, "The absence of conscious desire for help presents a greater challenge . . . than the presence of psychosis!" I believe this is true for learning science, language, or any other area of interest as well. In my experience, there is little you can do to stop a motivated person from learning. Conversely, there is not a whole lot you can do to lead an unmotivated person to learn something.

I assert that motivation is an intrinsic quality within each person. It is not possible "to motivate" someone from outside, extrinsically. *Motivation comes only from within the person.* Outside conditions can stimulate people to explore and can be related to the development of curiosity, but only the individual can *become* motivated regardless of how much outsiders (teachers, parents, employers) wish for him or her to become motivated. The best we can do is to provide rich conditions and human support within the learning, living, working, and playing environment. It is important to work toward betterment of these environments and for us to provide a great deal of human energy in hopes that intrinsic motivation will develop, but we must not expect that we can cause it to occur. We can *condition* people through operant conditioning techniques such as those of B. F. Skinner, but if we do this, we must remember that a conditioned person is not necessarily, and, as a matter of fact, often is clearly not operating from a basis of intrinsic, personal motivation. It is possible that operant conditioning can lead to intrinsic motivation, but I prefer other ways of approaching the problem of motivation than the manipulatory approaches I see in use by people in the area of behavior modification. (The specter of *A Clockwork Orange*, exaggerated though advocates of behavior modification may claim it to be, looms too large for me. I successfully used operant conditioning over a period of years as a "learning inducer", and I did not like the results.) A more open approach to enrichment and development of learning environments, without the built-in expectation of inducing certain definite results, appeals much more to me.

A third major assumption I wish to identify in this chapter is about the nature of the learning process itself. I assert that learning consists primarily of finding connections between things that we didn't realize previously were connected. Learning is a process of discovery and creation. Only functional, personal inquiry can produce learning, if it is, indeed, an intrinsic process. Perhaps it can be stimulated from the outside. But the actual learning goes on inside the learner, and we on the outside who call ourselves teachers, facilitators, tutors or what-have-you really have very little to do with what learners who work with us actually learn, regardless of what *we* cover.

Change is an essential part of the educational process. George Leonard has defined education as the process of change in the learners. If there has been no change there has been no education.

The education of each individual turns out to be different than the education of any other human being, regardless of how the system of schools is organized. Learning goes on throughout all waking hours and probably during many sleeping hours as well, given the abundant evidence that virtually all people dream several times a night. Dreams provide recombinations and syntheses of perceptions that constitute what I am willing to call learning. Just as I have done, you must have awoken in the morning (or even in the middle of the night) some time or the other with an idea or a solution to a puzzling problem. Given the total circumstances in which each of us lives, the total learning environment and the access to perceptions must be unique for each human being who has ever lived. Yet, for the most part, schools seem devoted to the maintenance of a status quo in which the educational inputs provided by the school to each person are supposed to be the same, rather than being changed to meet the individual circumstances and needs of each individual.

This is why I favor change as a part of the very fabric of education in science or any other subject area.

Change can be episodic or constant. In episodic change, a plan for change is made and implemented on a system-wide basis. If it "works" it becomes institutionalized and becomes a new status quo to be modified as a new idea is generated. Each episode requires a large input of energy and planning, obtaining permission, defending, and documenting. Most of this energy could have been spent in implementing.

In a constant-change model, new ideas are tried almost immediately, with little advance planning. This does not mean without any thought. The person doing the changing does not require advance permission to make a change. She or he also spends a minimum of time defending and documenting. Other people operating in a constant change model trust the implementer to try things, to be receptive to direct situational feedback, and to modify changes one way or another on a continuing basis. Change is related to specific situational needs and is succeeded by new changes appropriate for new situations. The energy required to initiate change is dispensed in small doses on a regular basis, and the bulk of the energy available can be devoted to actual operational matters.

Change can be cosmetic or it can be functional. Cosmetic changes (which often relate mainly to procedures rather than substance) make the situation look better but do little to correct, treat, or eliminate the blemish that they hide. Applying cosmetic changes can be compared to treating a serious wound or a cancer with a bandaid. Functional change, on the other hand, deals with higher levels of needs and problems in the educational system. It doesn't necessarily require more energy to make a functional change than it does a cosmetic one. Yet a substantive change may make a difference whereas a cosmetic or procedural one is unlikely to.

Functional change within a constantly changing system provides a way of responding to the educational needs of unique people in a constantly changing society.

I am not referring here to "any old change" but rather to change that is *responsive* to the felt needs of individuals and to their basic well-being, health, and mental and emotional growth.

On a visit to a large southern university, I was asked by a chemist how I defined "education". I answered with Leonard's word "change". This appalled him and he began to recite a whole catalog of negative kinds of changes that might be possible. Whether education proceeds in the direction of negative or positive change depends on the overall quality of the learning environment we are prepared to offer to learners. Given the severe problems that confront our society today and the conflicts we see between people, I would say that the educational environment we have offered in the past has done little to improve society. R. D. Laing points out how ill a society must be in which "Normal men have killed perhaps 100,000,000 of their fellow normal men in the last 50 years." This may be because of our general lack of knowledge of the effect of "education" on the learning process. I feel that we have a good deal of knowledge about the learning process, but we apply very little of what we know, so attached are we to the preservation of *The School* in the form in which it has, for all intents and purposes, existed for over a century.

The idea of learning centered around the individual rather than about some abstract subject matter has existed since before the times of Socrates. Somehow it has always seemed a revolutionary and radical idea. It has never been very fully implemented. Perhaps this is because the adult attitude that "older people (father, mother, teacher, etc.) know best" always wins out. In more modern times John Dewey devoted a lifetime to exploring how learning could be facilitated in an environment where the learner takes control of most of his or her activities. Carefully conducted research studies verified that students from schools operated in the mode suggested by Dewey did produce at least as high-quality cognitive learning as other schools of the day. Yet, for some reason, the critics of progressive schools always fail to acknowledge the Eight-year Study, perhaps because it gives results counter to their pre-conceived notion that freedom cannot lead to learning. Students from A. S. Neill's Summerhill School, which has now operated for a half a century, have apparently gone out to rich and full lives. Neill did not care much about traditional academic values and cognition, and so there would be little point in trying to compare the cognitive, academic-type knowledge of Summerhill students with that of others. Neill's students have turned out to be well-adjusted, well-functioning citizens who contribute effectively to the society in which they live and who feel joy in life. A number of them

have become leaders in various areas of interest. Few schools can claim more. Most would have to admit to more maladjusted "products" and "failures". Studies of what has happened to Summerhill students over the years continue.

The work of Jean Piaget with young children has emphasized that children go through more or less orderly stages of development. There is little point in trying to force them ahead with work that demands a higher stage of development than they have yet reached. Stages cannot be missed without detriment to the child. Different children progress through these stages at different rates, and the rate does not necessarily have any strong relationship to functional "intelligence" or to how far the child may actually go in his or her learning. Piaget's work does not make me want to hurry young learners along, but it increases my awareness of types of things they might be interested in doing at certain stages. It helps me to set up a richer and more functional learning environment to enhance the development of younger children at least in areas of science and quantification in an effective way. It helps me to be patient and to understand and be aware of the ways in which children behave. In this awareness I can find more joy and delight in the things they do and I can be much more patient and accepting of them.

Jerome Bruner has expressed the view that a person of any age may be capable of learning any concept in an intellectually honest way. This, in a sense, may seem to run counter to Piaget's idea of sequentiality of certain kinds of conceptual growth. But the big trouble with Piaget's research techniques has been the problem of how you test children for the things he wants to find out. A recent letter-to-the-editor I read in *The Journal of College Science Teaching* was entitled, "Piaget doesn't know how to talk to children." The note, from a person who has worked for years with young children, suggests that in testing notions such as ability to understand the concept of conservation (a basic Piagetian task), children often "fail" to show understanding not because they fail to understand the concept but because they do not express their understanding in words that give them a "pass" in the test protocol!

B. F. Skinner has developed hypotheses suggesting that man is not really free. We are too much conditioned by the things and influences around us to claim real control over our individual lives. Consequently the role he sees for teachers is to accept that they are conditioning young people and to use the best and most effective techniques for doing this. Skinner allocates little real importance to feelings as having a significant role in the learning process.

Carl Rogers, Abraham Maslow, Fritz Perls, and others who have worked with them take the view that each of us is as free as he chooses to be. Each of us has the potential to do far more than any of us can imagine. Effectively there are no real limits to happiness, achievement, and good feelings. All of these concepts lie entirely within us and our attitudes toward ourselves and our lives. When I adopt this view rather than Skinner's view of man, my approach to education and learning necessarily changes. This is a highly optimistic view of man, and it is the one I choose for myself.

The words "educating" and "teaching" connote making someone know or learn something. I know by now that I can't make anyone know or learn anything. I am trying to stop having this attitude and expectation in my own practice. Time and again teachers use the old proverb, "You can lead a horse to water, but you can't make him drink," as a way of rationalizing what they regard as their failure to get things across to their students. I am finally beginning to get rid of that particular hang-up. More and more I am refusing to take responsibility for what others learn. This makes both my life and the lives of learners who work with me more enjoyable because those "shoulds" are no longer present to spoil our relationship. And, as far as I can tell, the functional cognitive learning that learners go away with under these circumstances is no less than it was before.

RELATIONSHIP: THE FIRST AND MOST IMPORTANT ELEMENT

Carl Rogers bluntly states that a psychotherapist's effectiveness has little to do with theory or technique. His or her effectiveness depends on the relationship established with the client. Rogers extends these views into the area of working with "normal" people in educational settings.

If the relationship is the prime factor to be considered, this helps to explain how science teachers with many different styles of working appear to be successful with some of their students. Even a very authoritarian teacher may become an important facilitator of learning with some people. I attribute this to the confluent nature of the relationship that must have been developed.

In thinking back to my own teachers, I remember my high school French teacher, Carrie Lane Charles, as a stern taskmistress. Some students didn't work well with her at all. She and I developed a relationship in which her apparent sternness did not terrorize me. I attribute what success I had as a learner in this area entirely to my own efforts, but she was an effective facilitator for me even though she would fit into the "authoritarian" category of most personality classifications. I remember other teachers, too, not for what they "taught me" in a cognitive sense, because that really wasn't very important from today's point of view. Each of these people comes back to mind for the whole person that he or she was and for the integration of emotional and cognitive factors that developed in our relationships. Roger Deane was positively dull as a lecturer in geology 102 at Indiana University, but he held me in high regard and let me know it. He was interested in me as a person and didn't seem concerned when I made "mistakes". He was the first person I consulted eight years later when I was considering switching from modern languages into a career in geology. He dared to express unlimited and unqualified confidence in me. (When I later applied to the very department of geology of which he was then a member, I received an extremely discouraging letter from a less supportive chairman there. I finally went to the University where the letter I received showed real support for me - all of me - and my goals.)

What did these "good teachers" have in common: Carrie Lane Charles, Francis Peacock, Antoinette Billant, Roger Deane, Lander MacClintock, Herb Hawkes, and others? None of them were "open" educators. Open schools weren't around at that time except as small private schools that remained as remnants after the progressive schools of John Dewey's era. With each of these people there was a relationship that transcended the school walls. I knew something of their home lives and they of mine. I lived fairly close to some of them as person to person. All of them were honest with me. Yet whether I did something they liked or didn't like I knew that they always held me in high regard. They were *real* people. They were 3-dimensional. As I write this I am aware of a flood of memories and emotions related to those teachers who were important to me. I clearly see faces, feel their touch or imagine it even though some of them may never have physically touched me. I feel emotion and joy in the simple recollection of relationship. If I extend my thoughts into summer camps and the so-called "extra-curricular" areas I come up with other names and faces - Dean Miller, Ben Bennett, Mr. Keefer, J. K. Wolfe, and dozens of others - many of whom were not officially "teachers" but who were facilitators for me.

So if relationships are more important than anything else, how do you or I establish them? How can we be aware when we don't have one we're satisfied with?

What do I *do*? Go to Dale Carnegie and learn how to win friends and influence people? Go sign up for a good touchy-feely encounter group? Call everyone by first names? Slap backs? Do these things make me just become another of those phonies who populate Holden Caulfield's mind in J. D. Salinger's *Catcher in the Rye*? People I know who are involved in so-called "humanistic education" get a lot of static about that. What is important is *being* - how we *are* - rather than *doing*.

Somehow, you've got to be real. It can't be faked. I guess that more than anything else I have to be really in touch with myself first.

If I want learning to be centered around the learner don't I have to wait for *him* to initiate the relationship? Is my job *just* to respond? If so, that puts me in the position of the Deweyian progressive teacher reputed to have stood, facing the corner of the room, until someone spoke to him first.

Realness means that I initiate what I feel like initiating *when* I want to. If I really want to talk to someone I must take responsibility for initiating this talk. If I hold back, I'm not very honest or real. On the other extreme, if I speak because I think I'm supposed to, then I'm equally phony. I can't make rules. I can just try to be in touch with how I feel at the moment.

As Rich Joko recently wrote to me, "I feel that it is just as important for the *teacher* to exercise 'his' will as it is for the students. Recently, I have seen too many teachers in 'open' situations who have 'freed' their students but who have 'imprisoned' themselves by not realizing that they, too, have a right to be free and to be heard."

I can say out loud what I happen to be feeling. The usual way of breaking silence may be with a shallow "How are you?", "How'd you like the football game today?", "Why weren't you in class yesterday?", or "I suppose you've come in to see what your grades are." A better way may be either just to let the silence go on as long as I am comfortable with it, or to initiate verbal activity by expressing my feeling, "I notice that we are sitting here quietly together and I begin to feel uncomfortable with the quietness. I find myself wondering what things you are thinking about."

If I can make a statement such as this, I require no answer. I do not put the other person on a spot. Basically I get really in touch with my own awareness first, and then I express this awareness as something within me. I can even feel anger and express it in a way in which I do not threaten the other person. For example, "I feel very uptight this morning. I get all wrapped up in other things sometimes and then I feel annoyance and anger in a general way when there are interruptions." Maybe that's not very well expressed, but I hope it conveys the idea I intend: that I am not blaming the person sitting with me but am merely trying to communicate what is going on inside me.

In this way of initiating a relationship, nice phrases all set up to use in manipulating other people won't work.

More and more, I find the avoidance of questions helpful in initiating a worthwhile relationship. If someone comes to me, presumably he or she has something to deal with. I want to leave room for that to come rather than sidetracking the conversation. At the same time, I want to help establish conditions of comfort for the other person, and small-talk may help in setting an appropriate mood of trust.

George was having bad feelings about a faculty member who was talking about how open his class was, but who, in George's view, was being phony. We talked about this for a while and then he decided, after much hesitation and knowing full well that his comments might not be well received, to confront this teacher with his feelings. When he tried to do so - to bring out a very difficult point and deal with it - the teacher skittered about from one subject to another, didn't really listen to George at all, and the meeting was a failure from George's viewpoint. George later complained, "What's the use?" No relationship possible there.

Helen, a student in geology, said she wanted to get together one afternoon. When we sat down, we remained silent for a long time. It was a comfortable silence and we simply enjoyed each others' looks and eyes non-verbally for awhile. Finally, she took a deep breath and said, nervously, but glad to get it out, "I really didn't have anything in particular to talk about but I just wanted to be with you and to talk. In three years here I've never felt before that I could do that with a teacher and now I do." All I could do was rejoice that we could really begin to know each other and that I hadn't spoiled her moment by getting us off into some helpful, "easy" track to "make her feel at ease." We had several important encounters later, and at each I felt that we were close and could learn from each other and profit from each other's company. I always went away from one with the same feelings. Maybe a few encounters like that will be as important to the growth of Helen-the-scientist and Helen-the-person as any number of lectures given and received or lab activities worked on together. If it ever gets to be Helen and Bill working together on a joint project in geology or ecology then I know *now* we would work well together and learn.

Chipper wrote that our relationship "seemed to skip over lots of the usual peripheral things and get right to a genuine warmth/acceptance level." Instead of learning lots of things *about* each other and communicating *information*, we somehow got to *know* each other first and we are just now starting to learn about each other and our specific interests.

In confluent education we develop similar access routes to subject matter as well as to people. Usually the stress is on knowing *about* subjects. In a confluent mode we experience and begin to become one with our subject before (or better yet, perhaps, while) we learn *about* it. Alan Watts writes of this notion in *The Book*.

One problem is that, in their own timidity and fear, many people approach teachers with a flood of what Fritz Perls calls "chicken shit".

This is their way of avoiding the issue they really came to deal with but are afraid of. In order to initiate a worthwhile relationship, I may feel the need to cut off the chicken shit. How to do this without cutting the other person down? My immediate feelings of the moment and my being in touch with them and as aware of the other person as possible may help me. I can express my feelings as something *within me* rather than saying, "Why don't *you* cut out the chicken shit and get to the point. I'm busy." If I use that response, blaming him or her for my annoyance, then I probably cut off the possibility of further relationship.

Another thing I know is that I make mistakes and will continue to make them. Every time I openly identify feelings within myself, I risk having them rejected. An attempt to initiate a relationship may not succeed, or it may succeed without my even sensing it.

When Ken came to a workshop for science teaching assistants he had negative feelings about many things. He seemed not to participate, despite attempts by several of us on the staff to initiate relationships. Three weeks after the end of the workshop, I received an incredible letter in which he poured out a flood of good feelings that he had not yet been ready to express. He is becoming a successful and exciting facilitator for learners he works with. Incidentally he's doing a decent job as a "scientist" too.

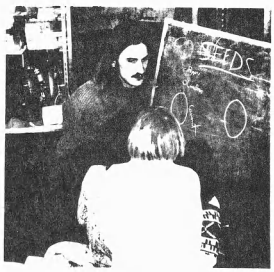
Walt, a senior-level college teacher, attended a later workshop. He seemed to be a recluse and wouldn't talk to anyone unless you got him over in a corner. Other participants even came to me and said, "What's up with this guy? Is there some way we can bring him in?" I chose to let him go his own way and try to be there to respond should he seek a response. A couple of times I sat down near him for a while and we ended up having short interchanges. Back at home, he set in motion a whole new multiple-alternatives scheme for students in his beginning science courses. Perhaps his innovations didn't shake up the world, but they provided a whole series of new opportunities for students in his group. I wonder what he would have done if we had tried the "hard sell" or tried to force him into interaction groups of some kind? Walt had to do it his way.

I can't expect instant relationships. I can't even necessarily expect that I will recognize that a reciprocal relationship has formed. The person I'm dealing with may choose to hide his or her positive or negative feeling about me. I hope to become more sensitive to expressions of such relationships, but I don't have any illusions about ever being sure in many instances.

Oddly, I sometimes find that something I write leads to a relationship I may know nothing about. If you like something you read here, you may know part of me and relate to me. For my part, I feel definite and strong relationships to lots of writers I admire. (I develop negative relationships to people in the same way.) Every now and then someone will write to me out of the clear blue sky or come up to me at a meeting and identify himself or herself as a person who wants to build or explore a potential relationship.

J. L. Moreno, in *Who Shall Survive*, indicates how people who write or "go public" in some way or other may be involved, often totally without their knowledge, in a whole series of personal relationships.

I write a lot of "personal" letters and communications that I hand out to large numbers of people. I once got one note from a learner I admire greatly in which he referred to some of these as my "wise-assed notes." So when I put a thought of the moment on paper I take a risk of hurting relationships as well as of enhancing or maintaining them. Come to think of it, though, perhaps the learner who made the comment about my wise-assed notes and I actually have a closer and more honest relationship now than before. Perhaps we will work better as a result of the risk he took in responding to the risk I took in writing my notes.



SOME PROBLEMS OF FUNCTIONING IN AN OPEN-STRUCTURED SCIENCE CLASSROOM ORIENTED TOWARD CONFLUENCE

A SLIGHTLY VEILED, ALLEGORICAL, METAPHORICAL, ACADEMIC DRAMA

Stage setting: *Mineralogy room (in case of lack of such a room, use a paleontology room, a map room, a general science lab, an elementary lab, a biology lab, physics lab, chemistry lab, a lecture room or whatever makes this drama's director feel good).*
Time: *A morning when an instructor is "supposed to be there" to "teach" whatever subject he's "supposed" to teach.*
Stage directions: *Curtain rises: Twenty-three students are sitting around a large table. They are not talking to each other. They all have bored expressions on their faces. Three are reading newspapers. One is leafing listlessly through a beginning textbook. Two are working on their math assignment. (They have been there for 20 minutes waiting for the "teacher" to appear to "teach" them. Clock on the wall shows the time to be 9:30.) The group sits on stage this way for five minutes with one person occasionally whispering something to another person, but the overall feeling should be one of waiting, boredom, slightly uncomfortable quiet. At the end of the five-minute period of quiet after the curtain goes up, a teacher type comes in. He begins to talk. He improvises, using complex scientific terminology for about five minutes. The curtain falls.*
End of scene

An alternative play:
Stage setting: *Mineralogy room (in case of lack of such a room, use a paleontology room, a map room, a general science lab, an elementary lab, a biology lab, physics lab, chemistry lab, a lecture room or whatever makes this drama's director feel good).*
Time: *A morning when an instructor who said he would be there to join a group has not yet arrived.*
Stage directions: *Curtain rises on ten students sitting around a large table. During the course of the scene 13 others will enter the room at intervals (singly for the most part, but with at least one pair and one triplet). They all have very expectant looks on their faces. The first ten are having an animated conversation about mineralogy (or paleo, or what-have-you). Actors should improvise here. As each newcomer arrives he is greeted by a couple of the other people in the group. He stands around on the edge for a while, apparently getting the drift of the conversations, and then plunges in with his own comments. (All dialogue to be improvised.) Very informal, open conversation, but it should, along with its light humor, also clearly represent serious exploration. After about five minutes an older looking man enters. He is dressed in the same way as the other members of the group, and he has a bunch of charts and other paraphernalia under his arm. He receives the same greeting that the other newcomers have gotten (with only a couple of people even noticing that he has arrived. The others are too busy with their own discussion to acknowledge his arrival.) The "instructor" sits down, listens for a while, and then begins to add comments in exactly the same way as the others have. After a while, he spreads out some of his charts on the table (in response to a request by one of the group members that he show them what he has brought along today). The members of the group begin to talk about the charts, with the instructor being still simply a group member rather than a leader as such. From time to time, one of the group members puts on his coat and leaves or goes out to get a cup of coffee and returns with it in hand. At one stage, five members of the group get into a separate conversation and go off in a corner, separating themselves from the main group. Finally, the curtain goes down, in the midst of continuing activity of the group.*

WHICH PLAY WOULD YOU RATHER BE IN?
IT IS YOUR CHOICE WHICH KIND YOU ELECT. THERE ARE PARTS AVAILABLE FOR EVERYONE IN EITHER PLAY. ALTERNATIVES GIVE YOU A CHANCE TO CHOOSE. TRY-OUTS BEGIN HERE AND NOW.

-- SLU Geology Newsletter
Nov. 15, 1972

When we first moved into an open-style learning environment, in the hope of developing a confluent kind of educational setting, we more or less abolished regularly scheduled meetings of "classes." People floundered a good deal. The same thing happened at State. Students got the idea that it was against the rules to have class-type group meetings at all. Mary, a professor at State, actually told me she was not even *allowed* to lecture. This was not true, but she made it true for herself. Some of the students said they wanted her to be able to lecture. She wouldn't, though, because she understood that she wasn't supposed to in the "new system." Many students had trouble coping well with the problem of creating their own intrinsic, personally-developed structures. The faculty were mainly used to having an extrinsic structure, too. Their extrinsic structure consisted of having to be in a certain place at a certain time to give a lecture or lead a lab. They knew that most of the rest of their time would then fall into place in the course of preparing the lectures, setting up the labs, preparing exams and grading them, and other routine matters.

When the formal class schedules disappeared, the faculty members scheduled time blocks when they agreed to be present in the lab. Trouble was, few people came to the labs to get help. So the person "on duty" would just sit there and wait, perhaps with a book to read to pass the time. I went in one day and found George, a young teacher, sitting there reading. He said he really found sitting there a waste of time, but he seemed unready to take responsibility for doing something else such as setting up a research project or something. His time schedule said "responding time" and so he sat there wait-

ing to respond, even though no students were there. The extrinsic structure of the agreement to "tend the lab" seemed to inhibit his becoming involved in something else he might have wanted to do. Since that time block was "scheduled," he didn't have to make any decisions about it, however.

In general, the upper-level students did manage ultimately to cope with finding personal structures of their own. There was a requirement that each student should produce a certain number of written papers per term and this piece of structure elicited activity. Some of the work became a personal kind of research activity. Students who completed projects that were valued by others in the group developed a sense of personal accomplishment and of having done something that really belonged to them. There was still pressure to complete papers. Even with their sense of personal accomplishment, several of the students still complained that they *wanted* courses and that they felt bad because some of the faculty wanted to give courses but felt they were not allowed to do so.

A year after my first visit to State, I returned to find that the faculty there had generated a whole raft of small-group, seminar-type activities. In one of George's groups, students were lecturing to each other on pre-selected topics about carbonate rocks. Except for the person lecturing, the others present seemed mainly to be listening or day dreaming and I had a feeling that people were mainly there because they were supposed to be rather than because they really wanted to deal with that aspect of carbonate rocks at that time. Besides, if they didn't come to talks given by their peers, their peers might not come later to talks given by themselves. In Mike's seminar on oceanography, he did all of the talking except for a very occasional question or comment. He occasionally questioned the students too. For all intents and purposes it was a casual, unprepared lecture to which people came at regular times on a scheduled basis. These sessions had a good deal of informality and there was perhaps more interaction than in a lot of educational settings, but there was still largely a feeling of irrelevance and of submission to an extrinsic set of needs rather than to intrinsic ones.

Does a discipline or does an area of subject matter itself have needs - intrinsic needs of the subject matter itself - to which I must subject myself (as essential extrinsic conditions) if I want to function in that area?

The word "discipline" indicates a general understanding that areas of subject matter do pose requirements of their own that may be extrinsic to the individual learner. My personal belief is that we unnecessarily limit the growth of knowledge and of intellect by taking a narrow view of needs imposed by a "discipline" and to which we must subject ourselves before being able to perform.

At State during that second extended visit, I talked to Ray, whom I had met a year before. He told me that he felt the seminar program was an improvement in providing helpful structure. No one was required to attend any of these sessions, but most people did. He remarked that he hadn't done anything that he could really call his own during this year of seminar-rich activity. He admitted that it was simply easier to go listen to someone else talk than it was to generate something of his own. The reward of a self-generated activity was much greater, but he was willing to give in to the extrinsic structure provided by a faculty trying to figure out what to do with themselves, too. Since the faculty generally rejected the role of "practicing scientists" and chose to use their time giving seminars most of the time, the students responded by doing less that was original, too. The increase in extrinsic structure increased the apparent activity going on, but it reduced the amount of self-originated involvement going on.

We have gone through this same kind of process at the school where I work. After a year of floundering, our students wanted more extrinsically organized things to choose from. Some of our faculty had difficulty responding to large numbers of individual students as they wished to. Part of this was due to their feeling that they were still responsible for what their students learned. Thus they felt a real need to keep track of their students, to give the students work to do, to respond to what they considered "intrinsic" needs of the discipline, trying all the while to shape and develop, from an external point of view, the intrinsic needs of the students.

They began to re-introduce their own structures in an attempt to give the students more reason to be around the place. If we didn't give them things to do, by way of assignments, group meetings that *we* organized, films that *we* ordered, equipment that *we* set up, and tests that we made up, then perhaps they wouldn't be able to cope by themselves. We, too, failed to introduce perhaps the most significant pieces of structure we could have used: our own involvement in our own personal intellectual growth.

The number of class-type offerings has continued to grow. We all understand that no faculty member has any number of hours he must assign to any particular activity. Yet we have set up an incredible number of group-contact hours - exceeding that of most conventional departments by a great amount. Oddly, our "unstructured" department has more structured and scheduled hours than any other department on the campus. One of our people has twenty-three contact hours this term. He knows he is free to reduce this if he chooses. True, some of these are relatively informal contact hours and do not require a conventional type of preparation. But I still have the feeling of students waiting for someone to do something for them or to them to make them into scientists. I don't feel as much as I would like to the feeling of individuals taking responsibility for finding out from a basis of intrinsic motivation what science (or any functional knowledge) is about, what they want to do with it, and how they can add to knowledge and human growth in a creative way rather than just being able to use yesterday's knowledge to function in yesterday's way.

Another of our staff members has scheduled several different things, too. He runs a small group lecture-discussion for beginning

students. His groups are pretty work-oriented. Last term he gave every student a small sample of rock material and told them they had all term to learn everything they could about it and to report on it. The material was all new, unstudied stuff, too. He took a group of three students on an extended field expedition last summer. He and his students have several papers in press describing their work. This is original work, but there still is a strong element of central direction. This represents a high level of work for undergraduate students. It is somewhat narrowly disciplinary, but it will produce good, conventional scientists in this area of interest. The teaching and research functions seem generally to be integrated.

Another staff member stresses standard techniques and methods. People who work with him learn the methods first, in his way basically, and then they are asked to apply the methods to analyze a new set of maps or photos. Students are then asked to present their results to each other for group critique. Once a student in in one of these courses, he is expected to stick it out for the whole term. In general most of the students do not deal with original problems in original ways. They learn to review, use well-tried techniques, and analyze but not really to generate new questions and new techniques.

Looking at myself, I find the same reluctance to give up structure. I impose a structure on myself, and this often interferes with my spontaneity. I have rejected standard kinds of patterns that, once formed, become similar in their effects to extrinsically imposed commitments. In this respect they may not be a whole lot different from the patterns used by others in our group. I am trying to avoid getting locked in by reviewing my structure regularly.

Let me review my structure as I see it at the time of this writing. Today, a Friday in spring, 1973, is writing day. I've decided that the only way I can satisfy a compulsion to write is to assign a regular morning when I habitually sit down to work on piles of notes that I want to deal with. The chief project right now is this book. However, sometimes I get off on a tangent and write something else. Then I feel guilty. Locked by my own system. Sometimes during part of Thursday or even earlier in the week I anticipate the coming of Friday morning, which I try to hold free from all other commitments. At other times it's a positive drag, but I try to discipline myself so that I fit my system. Sometimes I get up in the morning with an urge to write. Or this may happen on an evening. Then I may sit down and either write a fairly final draft or I may sketch detailed notes for a future essay. When a Friday morning starts out as a "dry day," I can sometimes retrieve one of those sets of expanded notes and work them up into a more polished draft. When another demand comes up and I lose my Friday, I sometimes let myself feel uncomfortable, as if I have cut a class, perhaps. I am usually "written out" by mid-afternoon and then allow myself to go tend to other matters. Today I am being "bad" in the sense of my schedule. I'm "supposed to be" (says my plan) working on another chapter, but this set of ideas presented itself and said "write me." So I gave in and am now feeling a rather perverse joy at having done something differently than I planned it. I am feeling a spontaneous kind of joy that helps my pencil trip along across the page.

I just remembered, though, that I have commited myself to two meetings in mid-afternoon. That's o.k. now, because I will have a high feeling within my structure.

This week is a strangely spontaneous one anyway. Lucretia, Cricket, Gretchen, William and I are living in the freshman men's dormitory for several days. Having students and faculty families get to know each other better is the idea. Institutionally sanctioned movement toward relationships and, ultimately, real confluence! Good! All of my usual schedules and personally imposed plans are working differently this week. Maybe that's why I feel this extra joy and how I so easily jumped into writing what I wanted to write this morning rather than what my outline said I *should* write.

Saturday is usually my day for getting caught up with office correspondence and "administrivia." The rest of the day is open for more spontaneous things. (Planned time for spontaneity? Hmmm!) When I use up all of Saturday for this I sometimes allow myself to feel down and out. If I don't finish all that I set for myself to do and if I feel a backlog building up, I get uncomfortable. I am just beginning to build the courage to say no to many administrative "demands." A large number of these can be easily ignored - perhaps even most of them. Yet how many people feel they must respond to every item that presents itself? This makes me think of the problem of the ringing telephone. Do you feel compelled to answer yours? I find that at my room in the geology building (it is important for me to call it my room, rather than my "office") I am now able to ignore the phone when I choose to.

Sunday is family day. But suppose the family doesn't want to do something together? For a while we said, "But you have to; it's family day." Now we've been able to get away from that to some extent, but the "control" of that structure still lingers.

As to "classes," I've been trying to replace these with "communication groups" which meet once a week. I ask everyone I work with to commit himself or herself to one of these so that we at least see each other for purposes of general exchange once a week. So far, this is working only half way. It's an extrinsic piece of structure I have put on and yet I haven't said, "You come or I'll use external force (*i.e.* grades) to force you to do so." Consequently, maybe half or fewer of the people show up for these meetings. The purpose of the meetings is not for me to present information. Any of that is done through handouts. The goal is "discussion" and I generally decline to start the discussion. Every now and then I try to introduce some "business" that will, I hope, facilitate a participative kind of involvement. But people are slow to

take it up.

I also schedule in some "mini-courses," whose goal is for a small group to get together once or twice a week for a few weeks to pursue some limited topics. These would be a little like the "seminars" at State or the regular sessions held by the other faculty people here. Only they are very topical. We have recently done minicourses on "environmental geomorphology," "symmetry," "metamorphic reactions," and "Friday afternoon slide shows."

A Monday-afternoon group called "just plain rock identification" seems fairly successful. A group of about a dozen met for the first meeting. Those who wanted to be lectured to and found no lectures dropped out for the second meeting. Now we've stabilized at about eight people. Our activity is mainly open lab *drill* work on rock description and nomenclature. A good response here indicates that repetition of this kind of session will be worthwhile in the future.

A special interest group of prospective secondary, elementary, and college science teachers has met on and off (a total of four or five meetings so far) this year. This has become a true communication group.

Commitment is a real problem in an open learning situation. It is easier to commit myself to preparation if I "have to" give a lecture. It is easier for a student to prepare, knowing there will be a test. The extrinsic structure allows us to avoid making real personal commitments.

I am committing myself to work actively to build our resource environment. One of my big involvements this term is to put together lots of semi-programmed and programmed lab materials for a big learning resources center which people can come and work in at any time. I find that as I spend time pulling these materials together, I am working more and more with students who are looking for projects or looking for a piece of resource structure to try out, or who want specific help in problem areas related to projects in progress, or who want to deal primarily with personal problems.

We can talk as we work together in the lab. I don't find myself waiting for students as much, "just because it's my turn to be tending the lab," and I seem to be somewhat more accessible than I may have seemed in my room (= office).

I still have lots of problems with tacitly letting other people structure my time for me. The key word here is "tacit," as far as I am concerned. As long as I realize what I am doing I can deal with this. If I tacitly accept the notion that I *must* have a certain number of contact hours of a certain type in a certain mode of instruction I severely limit myself and students who want to join me. I know that I can get around many of these things. What I risk doing, however, is setting up a whole new set of slightly different structures which my students tacitly accept just as they have accepted class-type formats for years of elementary, secondary and college instruction. If they allow themselves to keep attending things because they are there and even if they participate actively without being aware that they are basically being controlled from outside rather than building toward more independent modes of activity, they may ultimately be the poorer for it.

This is not to say that passivity is to be deplored. I wrote more about this in the chapter entitled "The Ash-lad Hypothesis" in *Consciousness and Creativity*. In that book, I phrased this hypothesis as follows (p. 75):

> *"Dabbling in the ashes may get you to your goal before you'd think so!... a relaxed, intuitive, spontaneous, gentle, aware, and generous approach to problems may lead to a solution before an institutionalized, rigid, formalistic, procedurally-oriented approach."*

If I am aware of potential dangers in overscheduling in my own life or in the lives of students or others who can allow themselves to become dependent on me, I may facilitate more rapid growth of creative powers, human potential, and of intrinsic activism. I may also be able to respond better in a spontaneous way to the real opportunity of a moment.

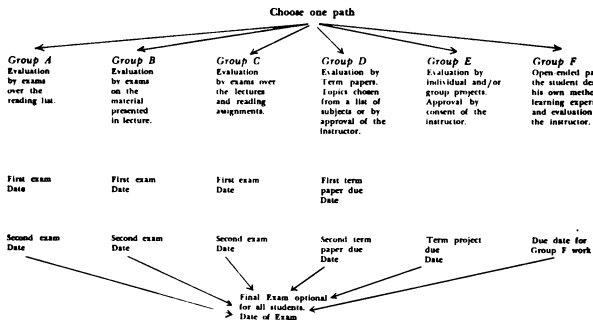
THOUGHTS ON COURSES

Courses are specific, planned activities that fit into a field of content. A course, by its very definition, is a set of scheduled events that you pass through, generally as a group. If it is a true "course" it goes over a definite track. There may be some flexibility within it. Generally, everyone starts at the same time, and it goes on for a whole term, whether people get tired of it or not. If I look at the courses at my university or my children's schools or at other colleges and schools I visit regularly, I see a bunch of straight-jackets, many of them required (the ones people would not take normally and which are thus probably most useless of all). So-called modular scheduling and other "innovations" do nothing to alter the basic notion of course as box or definite track. Programmed-learning "courses" allow more flexibility, but they are not really flexible unless they can be abandoned at any time with no penalty.

This can be a little like reading a book. If you're like I am, sometimes you get tired of a book. I usually feel that I ought to finish that book and have often grumblingly forced myself to do so. I'm just getting now so I can put a book down and leave it if it doesn't respond to my needs and feelings of the moment. I can accept courses as long as I and others involved feel free to suspend it or drop it permanently when it ceases to be regarded by us as a useful activity.

Some years ago I became interested in the concept of minicourses as a possible way of adding flexibility to the idea of course - at least to break out of the idea of semester-long courses. At Syracuse University we took the second term of the beginning course and split the 15-week term into three 5-week blocks. In each block we hoped to give students a choice of at least three options. So you were never stuck for more than five weeks with one instructor on one "subject." The faculty group at Syracuse never really committed themselves fully to the idea, however, and generally only two choices were given per time block. Still, evaluations of the scheme both there and in a number of secondary schools and colleges have been very positive. The students have given a vote of confidence to the idea of some alternatives. At Syracuse the alternatives were more in subject matter than in style, though, each mini-course being given in essentially the same lecture-lab format. At the University of North Dakota, attempts have been made to offer several styles of mini-courses from externally structured to free and open. Mervin Lowenstein took a single "course" at the University of California at Davis and later at the University of Michigan and allowed students a large number of "tracks" through the course, each permitting a different learning style. The diagram below, reproduced from Lowenstein's article, illustrates his scheme for "de-coursifying" his course.

In "open" classrooms courses are decoursified to the extent that no track or style is prescribed but many options are there. In essence a learner enters a widely defined area of study rather than a "course" even though the activity may, because of administrative inability to change recording and reporting


Choose one path
Group A
Evaluation by exams over the reading list.
Group B
Evaluation by exams on the material presented in lecture.
Group C
Evaluation by exams over the lectures and reading assignments.
Group D
Evaluation by Term papers. Topics chosen from a list of subjects or by approval of the instructor.
Group E
Evaluation by individual and/or group projects. Approval by consent of the instructor.
Group F
Open-ended path: the student designs his own method of learning experience and evaluation with the instructor.
First exam Date
First exam Date
First exam Date
First term paper due Date
Second exam Date
Second exam Date
Second exam Date
Second term paper due Date
Term project due Date
Due date for Group F work
Final Exam optional for all students. Date of Exam
Notes and rules:
1. You may change from one group to another with the approval of the instructor.
2. Any combination of groups is possible with the approval of the instructor.
3. Written and/or verbal proposals for groups E and F should be discussed with and/or submitted to the instructor.

procedures, still be labeled as a course. At this stage the limiting character of the "course" has essentially been destroyed.

In one set of activities I set up last year I decided that I wanted to participate in a study group devoted to environmental geomorphology. I knew that I could read in this area and undertake some investigations on my own, but I felt that a study group of five to ten people might provide a base of mutual support in which we could do more together than any of us could separately. So I hung up a sign announcing a meeting. I announced that I would not "lead" them through a course, but that we would meet once a week - as they chose - to share whatever we wanted of our studies. We agreed to some outside reading and to meet regularly. People could consider this activity as part of their credit for the term if they chose to do so. We would work out terms for legitimization in any way they wished (as a "project"). In all, we had four meetings. Attendance was so-so, with only a couple of people showing up at all four meetings. Generally, people seemed to be waiting for me to lead. I declined to do this, although I did make inputs when I wished to.

At the scheduled fifth meeting, no one showed up. Then I knew that course was over. I scheduled it again the following week and still there were no takers. I may try that subject again next year because it still interests me. Several of the participants from the group have continued on their own in this area, some even fairly seriously. I read a bunch of things I would not normally have read and learned of other avenues from the other people. Our minicourse *did* facilitate some learning.

I'm trying this same idea with several short-term mini-groups with people who have indicated a desire to work in multiple areas of rocks and minerals this year.

One group of students came up during our pre-registration and said they wanted to learn some structural geology. So I suggested they build their own experience - the three of them - and go it alone. I said I might be able to join them from time to time to participate, but that as of that moment I saw myself as largely committed to other activities. Already last spring they had begun to work together getting some references set and readings in mind. They agreed to try some preliminary observations during the summer, too, separately. Once the time rolled around to implement their group, they had a few abortive meetings and each ended up off on his own.

Some of our students wanted a "course" on oceanography. We had neither a "course" nor an oceanographer, but we agreed to legitimize a learning group for credit. They turned it into an ordinarily structured course. When some of the people didn't show up the others were angry. They had built themselves a new structure just like the ones we usually make for them. They apparently think that's the way it's supposed to be - that learning only occurs in formalized courses. Apparently the idea of a support and study group devoted to oceanography was worthwhile, though. A new group began setting up for the next year even before the spring term was over.

Andy wanted to do a course in meteorology. He set the whole thing up himself. People came some of the time and not at other times. Putting it together was good for Andy and they did have some good sessions. Only people who really wanted to be there went. This course went on for three years, a new group developing around Andy's specific interest and held together by his energy and interest.

Meg and Molly wanted to set up a reading group to work through and discuss the four Don Juan books of Carlos Castaneda. We provided a geography project number to arrange credit for their activity. (Geography?!!! Oh, yes, we called it "The Geography of Inner Space - Science and Reality.") I said I would try to participate if they could get a few extra people to participate. They advertised, and fifty people joined the group, most for credit, some not for credit. Since it was to be a "course," they set up meeting times, two evenings a week since not all could manage any one time. (Interference from other "courses," with no flexibility - a common problem of interfacing spontaneous groups with formally scheduled offerings in any conventional institution.) High energy prevailed in the early meetings, with attendance often as high as twenty to thirty people. Discussion was open, free, and frequently related closely to the agreed-upon subjects. Then energy began to fall off except for a group of "hard-core" people, like Meg and Molly, who had really set the group up.

A group of fifteen of us went to a university mountain lodge for an encounter group. It just happened that most of us were from the Castaneda group. We had planned no connection, but the connection became obvious as we gave ourselves to a highly spontaneous and playful personal encounter in which a primary focus formed around our views of reality. This was, as it were, a spontaneous "sub-course" within the other group.

Still, the compulsion to keep having the scheduled meetings on Monday and Wednesday evenings continued. At times these were productive, especially when the group decided to bring in other, outside visitors and reactants. Some people who dropped out early on rejoined the group. Others formed splinter groups of their own, separated from the main group. Others carried their study with them into other "courses" and actually turned the emphasis of these courses in the direction of their studies of Castaneda. Several of us in the "primary" group got into other related literature as we carried out our search.

Was this effort a "success" or a "failure?" I really don't know. As a "group" we often lacked vitality. Yet at other times we experienced a highly absorbing integration of emotion and intellect in the best tradition of confluent education. We still continued for the usual fifteen weeks. Perhaps we were too much controlled by such external ideas. Yet many of us grew a great deal, Meg, Molly, and others especially as they came to grips with

their acknowledged position as "leaders" and "organizers."

In a study group on geography and others in geology I have scheduled regular meetings for us on the normal course schedule. I have often felt frustrated by lack of attendance, by lack of advance preparation on the part of the students and even on my own part. Lack of a fixed focus is often a problem. How to hit a middle ground between fixed structure and expectations on the one hand and spontaneity and freedom on the other? In one such group I expressed a feeling of wanting to pull out, that we were getting nowhere. But several students pointed out a number of high-energy nodes we were experiencing and felt that it was essential to have the group *there* when they needed it - as a place of refuge from other, tighter parts of our institution.

It's hard, though, for any of us to break away from conventional ideas. The strangest sessions seem to carry the highest energy with them. And energy is a prerequisite for significant learning.

An example of an unusual and, at first appearance, seemingly foolish and unacademic meeting was a seminar we agreed upon as part of a cultural geography "course." We scheduled a session, which we announced in the university news bulletin, as "The Cultural Geography of Winnie-the-Pooh." A group of the people involved had been reading children's stories to each other, and since this seemed to be a focus of energy and interest, we decided to legitimize it as part of our "serious," "academic" work. We met at the appointed class hour in a house occupied by several group members. Beer was available. The readings began. We all *really* listened and a feeling of unaccustomed comfort and well-being suffused the group. At one point, a relatively shy member of the group took the book and timidly read. He read well, and received a high degree of validation of his personal worth from the group. Did this "silly session" perhaps open him and others to a kind of intellectual progress that might otherwise have been impossible? This, to me, was an example of highly self-directed, person-oriented confluent education as a triggering influence to functioning of both the group and its individual members.

I see a serious need to redefine in a very basic way the whole notion of "course." From a pragmatic point of view I think the idea of "course" may be too much a part of our system to disappear within the next ten or fifteen years. Redefinition can effectively change it out of existence in its present form. It certainly already has moved a long way in that direction in the groups I am working with. At present there are *no* real bars as to what a learner may study and when he may study it for credit in our group. There may be times when he can get more people to work with him and other times when he is alone, but he need never wait. Since we can do everything under the title "project" we require no permissions from curriculum committees or other such administrative sources. We don't care what the label says and we don't adhere to any truth-in-labeling policy if *we* see a label as failing to facilitate learning.

I think it will be vital to move away from the idea of courses in schools. For the most part, the idea of "courses" appears mainly in detrimental form. New ideas of flexible daily schedules being tried in a number of open schools may help in getting rid of the course-fixation. By the time college years roll around the idea of courses is very difficult to eradicate.

P. D. Ouspensky has written what to me are some highly significant things about obligation that many teachers attach to students in their courses. In a conversation with "G.", Ouspensky asks about the kinds of commitments he would undertake with respect to "G" if he decides to study with him:

O: "Are there any conditions for joining your group?... is a man who joins it tied to it and to you?... is he free to go and leave your work, or does he take definite obligations upon himself? And how do you act towards him if he does not carry out his obligations?"

G: "There are no conditions of any kind ... and there cannot be any... (Man) can decide nothing in regard to the future. Today he is one person and tomorrow another. He is in no way bound to us and if he likes he can at any time leave the work and go. There are no obligations of any kind either in our relationship to him or in his to us."

These statements, to my way of thinking, are essential parts of a confluent approach to "courses".

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I have heard lots of people asking each other, "What geology courses are you 'taking?'" That always makes me think of vaccinations. What are they laying on you this term? What have you had? Not "What can you do?" or "What things are you learning about?" or "What are you reading about?" or "What are you mapping, analyzing, etc.?" "What new thing have you learned to do?"

I find that I don't like to be "taking" things any more. I'd rather be "doing" things.

Experiences in the geology department need not be "taking" things unless you choose to look at them that way. I hope that lots of things going on will become "giving" things, too. Some of you may feel that you have committed yourselves to "taking" petrology or some other "subject." Why not take a broader view of the earth and let the "subjects" flow into each other the way they do in "real" geology as opposed to "school" geology? If there are lines drawn between "subjects" then you're the one who is drawing them. How do we break out of our own, self-made boxes so that we can each genuinely integrate what we are doing, learning, knowing?

-- SLU Geology Newsletter
Sept. 19, 1972

THE IMPORTANCE OF THE CONTEXT IN CONFLUENT EDUCATION

Everything I do in trying to help others learn science occurs in a specific situational context which may or may not be compatible with what I really want to accomplish. If the institutional context I am in is too unresponsive to my personal style, I have several alternatives. I can leave the institution and seek one more compatible. I can change in a direction so that I "fit." I can work to change the institution or can build a corner for myself where most of the time I can isolate myself in my basic mode of operations from the overall context.

Sometimes procedures are made into policy and individuals begin to respond to the procedures and policy rather than having the policy and procedures change to facilitate what the people want to do. This is a time of great danger to human beings caught in the middle.

Student teachers face one of the most difficult contextual problems of all in their first real teaching experience. Midway into the year they move into the classroom of a "master teacher" who has virtual power to exclude the student teacher from a conventional teaching career. If the student teacher displeases the master teacher, the master teacher can initiate reprisals. Feeling forced to respond to the expectations of a master teacher and of a university supervisor as well, many practice teachers tighten up, hide themselves and their feelings, and have a terrible time serving for the six- or eight-week period.

These days I am aware of greater possible mismatches than ever before. Many young preservice teachers have a sense of experimentation and eagerness to try new forms which may well exceed anything we have known in the past. This has always been a problem, but the movement toward open and confluent education may have increased the gap. More and more young teachers want to do away with grades, to relax controls, to get closer to their students as people. Most master teachers I know still stress control, discipline, testing and impersonality. ("Don't smile until the 10th week.") Worst of all, the inflexibility of school schedules at all levels forces students and teachers to be together at times which are arbitrarily set. With classes of twenty to forty students it is safe to say that no teacher ever has a full class of people who really want to be there during the specified time period or wish to do any single specified activity. The problem is accentuated at numerous times when the teacher would prefer to be elsewhere, too.

Imagine a student teacher coming into a science classroom hoping to establish an environment of trust and non-judgmental relationships and being faced with a group that may already be pre-disposed to disrupt and may already be hostile to teachers, science, and school in general. The context for the student teacher becomes an almost impossible one. All he or she can do is ride along with the context (or leave the pre-service teacher preparation program).

What in the context really needs to be changed for that student teacher? Practically, only one major element: if free exodus is guaranteed so that any student not interested can leave *without penalty* (and even with vigorous encouragement in the case of wanton disruptive behavior!) and need not be in the science area except when he or she wishes.

This one contextual element (freedom not to attend and without penalty) that schools seem not to provide probably represents the greatest single problem from kindergarten through graduate school, and it creates a particularly devastating contextual problem for student teachers.

The same holds true for teacher aides. I have seen regular classroom teachers ask their aides to do things for them that are incompatible with the style of the aide. A classroom teacher with a formal style and mode of operation may "require" an aide whose zone of comfort is an informal one to act in a formal manner. The aide may suffer greatly and his or her effectiveness drops dramatically in such situations. Pat, a science aide in an elementary classroom, excelled at working together on problems with small groups of engrossed students. The regular teacher ordered him to lecture to them on botanical taxonomy. The children swarmed all over Pat on the playground, enjoying physical contact with him. The teacher blew her whistle and ordered them off of him because they "should treat teachers with respect."

A student teacher or teacher aide wants to be called by his or her first name. The teacher orders that a formal "Miss" or "Mr." be used. (Cricket said to me the other day, "It just doesn't seem right to call her Miss Smith. She's just a couple of years older than I am and we get along fine together.") But a "policy" (real or imagined - a context in any case) is used to deprive individuals of basic elements of their personhood.

Of course a strong, secure student teacher or teacher's aide may resist the context, and some get away with it. Others are eased or ordered out. The student teacher may decide to put up with even the worst of contexts for a few weeks in order to get access to his or her own classroom. In the privacy of the closed room many things may be done - perhaps in partial secrecy and in collusion with the students - but at any rate done without such risk to survival.

One problem, however, is that developing a habit of too-easy compromise may ultimately help a student teacher to deprive himself or herself of a part of his or her very personhood. The person may (and in numerous studies this has been observed) actually become what the master teacher is.

A substitute teacher also has a severe problem of context to deal with. But a person with a strong personality may manage to introduce a temporary, new context that is personally acceptable. The very absence of the regular teacher automatically changes the context

abruptly enough so that interesting things sometimes happen.

Lone teachers can move ahead on their own. John Thompson opened up his classroom and allowed free activity in the area of earth science. The overall school context was rigid, but John's deviation was accepted as long as his students didn't disrupt other areas. John had advance permission to do this on an experimental basis, however, and only resisted the context for one class per day when he came specially to the school. Roger Hudiburg and Larry Crowley, both tenured teachers, managed to open up their classrooms in similar style in the same school where John started it. John's new context quickly spread when it worked. Many teachers, however, did not accept this deviant context and did cause trouble for the others. Their tenure protected them in this case.

Bill, a first-year teacher, tried to open up his middle school science classroom. He couldn't cope very well with a small core of disruptive students who were there because they had to be. Bill got negative feedback from some of the older teachers. He began to adopt a more conservative classroom management technique. It was then that he received notification that he would not be rehired the following year. At first he felt let down, but then he decided to finish the year *his* way. His survival behavior disappeared and he began to open up again and function creatively. A new job opened up for him in a new system.

Some of the teachers I have known who have been most successful in resisting the overall school context and creating a new one in their own classrooms are tenured teachers who have been in business for four or five years - three of operating more or less in the regular context and developing a sense of personal worth and security, followed by one or two years of tenured security to break mental, contextual shackles (habits) that have grown during the trial period, and then they are ready to exert their independence and develop the new context they need.

Context can have funny effects - at least I am aware that it does on me. When I recently served as an officer in the National Association of Geology Teachers, I found that people expected me to behave in certain ways at meetings. These ways were not always compatible with by way of being. I tried not to be affected by their expectations, feeling that what they elected was not some stereotyped automaton, but *me* the person. Yet even though I tried to remain the myself I chose to be, I was aware of some people's surprise, because to them I seemed to behave "out of context," even though I was the same I that they had known to act as I do act.

When I first became a science department chairman, I went to my first Dean's meeting of department chairmen. The meeting was in a lounge and most chairs were taken, so I sat on the floor. This was seen by some of the older chairmen as outrageous - that I should arrive casually dressed and that I should sit on the floor. When Gary went barefoot to teach a joint seminar with another faculty member, the older man almost couldn't take it!

I have been acquainted in recent years with several college presidents and deans, some of whom I knew before they were college presidents and deans. Funny how, after a year or two, many of them play into the *role*. One told me that he had gotten rid of his old chevrolet and had bought a more imposing, expensive car because he thought it wouldn't be proper for him to be seen driving that old chevy, what with his new position.

I remember being "outraged" myself in the past, when people weren't dressed as the context "demanded." At age 22 when I entered a first job with the government, all of the new trainees arrived at the same time. Most of the men were dressed nattily in seersucker suits and the right width tie and color scheme for U. S. government employees in Washington. Suddenly another 22-year-old - from California - came in, wearing a flowered, short-sleeved sport shirt and no tie. He was perfectly comfortable in dressing as he chose, in being himself without regard for the context, but many people, including me, muttered for days about this impropriety.

In a scene from the film "High School," a student is shown being disciplined by the principal and several other faculty members for daring to go to the school dance in a dress that came only to her knees. Dress codes in some schools make problems by setting up a context that has no bearing on the real function of schooling: learning, human growth, and development.

Context is a continuing problem. As soon as you try to institute significant change, you will be faced with conflict.

How can you deal with the context? I have found redefining it in my own terms a useful approach. A second requirement for me as I deal with the context is for me really to know who I am and to feel secure and comfortable in what I am and want to be and do. I need not alter my way of being in order to fit someone else's notion of what a person in "my position" *should* do. I need to make the job fit me and my capabilities rather than trying to shoehorn myself into someone else's model. I create my own job description rather than filling someone else's.

By redefinition, I mean that I change the position or situation to fit my needs. If I am expected to "take attendance" I redefine this and accomplish the function in a way that is satisfactory to me, and I communicate this to my students. If I'm required to keep a gradebook, I turn it into a notebook which is open to all students at all times and which we use to write notes as a progressive record of development and as a means of communication rather than a set of numbers, grades, and attendance checks. If I am required to give tests, I change the nature of the test to suit the needs of each group as, together, we define our mutual needs and goals.

"... I do not share the common fallacy of an antagonism between science, literature, and art, which appeal to me in much the same way. Creative imagination is the vital factor in all of them, and I was fortunate enough to learn this at an early age."

--George Ellery Hale

I can let my subject, "earth science," keep me from noticing that a development in biology, physics, history, or economics may be more important to my overall interests and even to my work as a scientist or science educator than anything going on in the earth sciences. I translate the question, "What subjects are you taking?" to "What limits have you placed upon yourself?" or "What blinders do you have on now that prevent you from seeing as much of your world as possible?" I have felt my own reading has been very productive in the last year, and I am astonished at how diverse it has been and how pieces out of one "subject area" suddenly burst forth as having a totally unexpected bearing on something very different. I find myself reading technical journals in geology, science education, and psychology (three "subject areas" that I think of myself as being involved in). In addition I find myself almost randomly reading, *Bury My Heart at Wounded Knee, Einstein - The Life and Times, The Invisible Man, I Never Promised You a Rose Garden, Awareness, Beyond Freedom and Dignity, The Organization Man, Hunger, The Hidden Dimension, A Sense of Community, Games People Play, Ibsen, In and Out the Garbage Pail, The Structure of Scientific Revolutions, Soul on Ice, The Once and Future King, Cousin Bette, Emile, Intuition,* and others. Strangely these all begin to have a bearing on each other. As I sang in *Elijah* last spring I found all sorts of pertinent earth references. I never know quite where the next inputs are going to come from that will trigger an important association in my mind.

Subject areas only exist because we invent them. We invent them to simplify, but then they grow rigid and we allow ourselves to believe that they are real. We make judgments as if they are really there.

I, for one, would like to de-departmentalize our university, to de-subject it. I want to transcend "subjects." At Evergreen State College they have a new designation for their faculty members. Rather than "Professor of geology," they are simply called "Member of the faculty." I don't know how you distinguish between those who pay and those who get paid. Maybe that's a whole other set of institutional factors to be redefined, too.

A move has been afoot for some time now toward what has been called *Unified Science.* A group called FUSE (The Federation of United Science Education) has formed and has been actively promoting a unification of the sciences for instructional purposes. In Australia a move several years ago to provide unified science instruction produced an interweaving of discipline-oriented materials, but there was no real "unification" as such. "Threads" from different disciplines were woven through several years of science instruction, but the threads retained their disciplinary biases and separations. To a great extent, the same thing happens in unified science here in the U. S.

When we produced the materials of the Earth Science Curriculum Project we thought we were really integrating things, but I still ended up writing certain sections on my kind of geology, other geologists wrote on their kind of geology, the meteorologists wrote on their kind of meteorology, the oceanographers on their kinds of oceanography, and the astronomers on their kinds of astronomy. We met from time to time and we did spark ideas among each other. Although I think we succeeded better than many, the disciplines show up as separate. Our vested interests came out as too strongly controlling. We somehow didn't find the combination for working together, probably because ours was a method-orientation rather than a problem-orientation.

In the Environmental Studies Project (ES) we succeeded far better because we took a problem-centered orientation. Basically we invited the students to take their own multiple approaches to only vaguely suggested problems ("Go out and photograph evidence of change;" "Find a million of something and prove it").

People who know relatively little about the various science disciplines may be the best ones to help us integrate and unify our approaches to the pursuit of knowledge. Perhaps the people who can best help us integrate and unify in science are the artists, musicians, historians, literary scholars, skilled laborers, economists, social scientists and others relatively far from our narrower interests. Likewise, historians may have more to learn about new problems and new approaches from physicists and biologists than they do from other historians.

In schools, perhaps teachers have more to learn from their students about interesting studies to pursue than students have to learn from their teachers. This is not to say that there is nothing students can learn from their teachers, although in some instances even that may be true. Rather it is to say that students may be better equipped to set or help set directions for their own individual studies. Teachers may be better equipped through their greater experience and restricted expertise to act as consultants rather than directors and managers.

Recent emphasis on the total environment and on various aspects of ecology and relationships among members of multi-component systems may help us move to a more problem-centered approach.

Again there is some kind of balance necessary between problem-centered approaches and integrated, non-disciplinary studies on the one hand and method-centered approaches and their accompanying discipline-oriented special-

ization and expertise on the other. At present the scientific establishment as a whole is, in my opinion, too far over the line toward the latter. Without any question I believe that science education is far off anything like an optimal balance point at the present time. Visits to elementary, secondary, and college classrooms throughout the U. S. and abroad convince me of this as does perusal of texts currently in favor. An interesting study awaits someone who wishes to explore method-centeredness versus problem-centeredness in the schools and in research laboratories.

George Prince's book, *The Practice of Creativity* (Harper and Row, 1970) contains many examples that make me think of negative effects of my own behavior. Like many people, I have been an excellent disrupter of meetings and killer of ideas. Awareness of this may help me to function better as a facilitator in a confluent environment.

A year ago, a colleague came up to me and proposed that we convert our "majors' room," a large room designed originally as a laboratory for elementary courses, into a room used more for class-type, group meetings. I immediately frowned and said I would not go along with that idea. I did not want to move the department further back again into a more conventional kind of facility. Last year I had spent weeks of frustrating attempts at getting carpet installed in part of the room to help give warmth. I had even contributed $250 of my own money to the purchase. I had managed to get mail boxes put in for the majors. After nearly two years of efforts, I had prodded people enough so that, on their own, they had finally begun to paint some wall murals. I thought people were *beginning* to feel that the room was now more than just *school*. But the room was not really functioning very well, yet. It is a large room, 31 by 40 feet, and with a high ceiling. To some extent students use it as a work room, keeping their books and study materials in some of the many drawers nd cabinets. We got a couch, several bean-bag chairs, a round table, and other pieces of furniture to make the room more livable, and yet it is still more a large cavern than anything else. Because it is so open, people who want to work are interrupted whenever someone enters the room and speaks aloud. It's so open that there is no privacy. Too much interaction?

Yet I feel very possessive about the *function* of that room. The idea of making it into just another classroom went up like a red flag. I tend immediately to react negatively to many ideas that I perceive as contrary to my direction. I may intimidate other people who are less vigorous in speaking out and contributing ideas. I think they often feel put down and rarely contribute except in contexts where I am not around to reject them out of hand. As a department chairman, I probably am seen as an authority figure to be avoided even though I wish to avoid any kind of "status-authority."

In the majors' room incident, I agreed to think about the idea. As I mulled it over, it sounded more and more like a scheme for diffusing majors into all of the labs, something I have long wanted to see happen. Maybe the very existence of a separate majors' room, carpet or not, actually inhibited the very thing I wanted to see happening.

The Practice of Creativity reinforces positive approaches to the receipt and consideration of new ideas. *Any* idea has within it good and bad elements. The best way to deny a group full benefit of the creative potential of any one of its members is to react too suddenly to an overall concept, in a judgmental way, before understanding fully what the idea may be about and without taking time to explore positive sides of the germ of the idea. Prince, working with Synectics, Incorporated, suggests what he calls the "spectrum policy." In this policy, each idea is considered to have a spectrum of ramifications from good to bad. Prince suggests taking what you or a leader or group member feel to be a *good* aspect of the idea and focussing on that aspect. From there, you build possibilities. You also come to understand the idea better and to find out more about what the person who contributed it meant in the first place and to help him clarify and embellish his own thought. If you don't understand the idea well enough to see its spectrum, then you begin by seeking to clarify what is meant, by asking non-judgmental questions and trying to rephrase the idea in various ways until the suggester agrees with your restatement of his own idea. Ultimately discussion can introduce negative factors, too, but in a positive way: "I like your idea about acquiring more space for the instructional functions you have in mind. Also we may then be able to provide more comfortable individual working conditions for each students. Now how can we maintain the informality I am seeking? How do we develop fuller use of our space than is true in a more conventional laboratory-classroom of the type that the majors' room represented before we made it into what it is now?"

Ultimately I came back to discuss this idea with its initiator, but only after I had flashed out an intuitive judgment based on inadequate understanding of what he was suggesting. When I take this view, I set myself up as the only person who has worthwhile ideas. In so doing I contribute to the maintenance of an environment that is not comfortable for the discussion of new ideas. The others will likely respond in kind, shooting down my ideas in the same way I do theirs in the kind of "retribution" that almost every human being engages in when he is put down by someone else. You have to "get back at him" first. As Prince labels one section of his book, "Everyone is in business for himself." Furthermore, in putting down the other person, I also decrease the probability of his risking to make later contributions. A one-man show is always pale and without force by comparison with one in which the rich potential of a working group is available.

I am trying to learn to bite my tongue. "Listen, and then you may not want to lash out, you idiot!" Really listening and supporting requires sustained effort and probably never becomes quite automatic or fully habitual.

The same thing goes on regularly with our portfolio review committee. I have come out *against* their reviews of students' products as judgmental and destructive, and every time one of the people I regard in our group as "conservative" makes any suggestion, I am inclined to start flashing my negatives even before the first sentence of the suggestion is finished. I usually come back and reflect and seek the person to discuss the idea fur-

ther, but, in a sense, it's too late to retrieve the full potential of the idea, because I have already set up a negative judgment that impedes consideration of the idea.

Perhaps I respond negatively in too hasty a fashion out of personal defensiveness. At meetings I often introduce ideas that are more radical, fantastical, and utopian than do others present. And these ideas are generally discounted without any application of the "spectrum policy" or attempt by the group to explore the good and (from their point of view) bad of what I am suggesting. They are too eager to say, "Yeah, but...." And the germ gets left in my mind to try elsewhere, with some new group. A consequence is that when I lead a meeting I am apt to push my own ideas, to want to *win* for a change. (According to Prince, a leader can only be really effective when he declines to put forth his ideas *while he is leading*. The solution to providing a chance for the leader to contribute is to have a special time, later in a meeting, for him to put forth his ideas. Better still, rotate the group leaders out regularly.)

Prince suggests that destructive behavior can be contagious. When I, as a participant, introduce negative elements, I perpetuate the denial of the potential that the group has. When I, as a group leader, fail to listen, explore, build on, and expand *every* idea to seek its potential, I increase the probability of a greater level of frustration.

One thing I can do when I am leading a group is to move the group away from destructive behavior I see materializing: "Wait a minute, George. Let's explore this idea further to see where we can carry it. How can we build on it?" Too often a germ of an idea which may have potential is destroyed before any useful exploration or attempt to allow growth. This is not to say that ideas are not rejected ultimately, but it is to say that *every* idea gets a full hearing and that the whole group, working together, agrees to work with it and to build on it *as if* it were the best idea they'd ever heard. In this way the group can be led in unsuspectedly fruitful directions.

I, as an individual, can attempt to avoid destructive behavior, and, even if I am the only one who does so, the group will be the better for it. I as a leader can manage the group to a considerable degree to avoid destructive behavior. If all of us in the group come to an understanding about the sanctity of any new ideas and the need to nourish them, then we can work toward maximum potential of the group.

I wonder how often I am destructive when I respond to student ideas in a learning situation? I think perhaps I listen more effectively to students than I do to faculty colleagues. But still I think of times I have reacted in a judgmental way too early, before hearing students out and without trying to help build on a good side of their ideas rather than hastily commenting about the bad side.

Prince suggests that a major problem to overcome is our lack of awareness of destructive behavior. Usually such behavior is habitual, unconscious, and unintentional. It just pops out. It occurs in forms such as negativity, rigidity, confusion, and competitiveness. Honesty is important, but if it involves telling the truth in a way that makes the other person feel defensive and worthless, it will diminish the creative functioning of the group.* Non-destructive honesty recognizes the potential worth and value of any idea and only later expresses concerns in the form of complete information applied without damaging any person and designed to strengthen the ultimate solutions to a given problem.

**An anecdote illustrating destructive honesty comes to mind. Several years ago at the University of Colorado, we were initiating a new interdisciplinary program with help from a federal grant. Several of us constituted what others viewed as a "radical fringe" trying to develop as totally open a concept as possible: students to determine what was appropriate for themselves to do, students to evaluate their own work, meetings to be without advance agenda, encounter groups, complete status-equality for faculty and students. We had a large number of graduate assistants, about forty or fifty, as I recall, and we had decided that these people would design for themselves a weekly seminar. At one of the seminars of the science-oriented group, a senior faculty member (a department chairman and chairman of the University's Faculty Council) took over the leadership role. As I observed his leadership I judged him to be manipulating the group and dominating the meeting. (Partially, I based my judgment on a pre-conceived stereotype I had formed in our earlier associations.)*

So I began to do an interaction analysis of the general type described by Ned Flanders. In such an analysis, the observer, at fixed intervals of a few seconds, tallies the kind of behavior that has gone on during the previous 5, 10, 15 seconds (whatever interval is chosen). Categories of behavior include "teacher giving information," "teacher asking question," "teacher receiving, accepting a student response," "student answering teacher," "student addressing another student." After fifteen minutes of observing my colleague, I found that, quantitatively speaking, he had talked for over 75 percent of the time. Almost no student-student interaction took place. I denounced him in front of the entire group of perhaps thirty or more graduate students and faculty who were present.

To his credit, he listened attentively and did not become obviously defensive. I was providing information and being honest about my feelings. Yet my denunciation did, I believe, hinder communication in that group. In a way I was trying to manipulate the "big man," to show that he was vulnerable, in an attempt to stimulate group interaction and "equality." A more positive approach, perhaps using the very same information, but in a different, less direct, and non-abrasive way, would, I suspect, have elicited the greater group response I sought and could have helped us solve our real problem: How can we design a seminar that will encourage wide-ranging interdisci-

plinary activity?

The important thing is to focus on the problem and to have all people view themselves as servants of the problem and its possible solutions, rather than of their own interests.

In *Crisis in the Classroom,* Charles Silberman writes about the mindlessness of modern-day education. We lead people through masses of information and try to condition them to view things objectively and rationally, but they see no meaning in it, no reasons for doing what they are asked to do. In science and the analytical disciplines, especially, we work toward simplifying our world view, working toward a concept of unity, but a narrow unity of few dimensions rather than an all-encompassing, bursting unity. We ask people to step back out of the world and measure *objectively.* Decisions based on subjective factors get questioned. We separate ourselves from the things around us and try to control them rather than submerging ourselves within the world around us, flowing with it, being at one with it, admitting that we are just a part of the whole.

Carl Rogers writes about important learning as a search for personal meanings. In general such meanings come out of personal experience: Thus, the primacy of experiential learning as a way to personal growth. Experience can have many more dimensions than things done physically. I believe that when we fantasize and dream we are developing insights and having experiences that may be *real.*

We learn to perceive, to see, and to experience not on the basis of what is *out there* but rather on the basis of how our own organisms interact with the world around us. Thus what we perceive depends, according to T. S. Kuhn, on our education, culture, language, and experience. We see the reality we are taught to see, and we can learn to see other realities if we choose to. Each of us, to some degree, sees a different reality, but to the extent that we are part of the same culture, we agree upon many aspects of what reality is. Professional scientists develop special views of reality. They have grown to agree about these and they control the membership in their "guild." They teach their acolytes their view of reality as a pre-requisite to certification into the society of "scientists." We have come, in western society, to accept this view, *strictly by agreement,* as a kind of official view of reality.

In the *Don Juan* books, Carlos Castaneda describes how he learns to see other realities through his re-education as an apprentice to the Yaqui Indian sorcerer, Don Juan. When Carlos feels, during a drug experience, that he has flown, he asks Don Juan if he *really* flew. The nature of the reality of flying, of the body's flying, of the imagination's flying, of the spirit's flying, arises. Was it important for Castaneda even to know where his body was, as he tries to find out from Don Juan, or was his experience of flight *real* regardless of where someone else perceived his body as being?

When we read something, see a film, view a painting, hear music, we may in a very real sense *participate.* As we enter into another person's experience we do more than just share it vicariously. We can never take it up just as it was for the person who created it as an expression of his or her own experience, but to the extent that we feel affected by it we make it our own by adding to it the totality of our own experience, values, feelings, and meaning. We can experience something as fully through reading, seeing, hearing as we can by physically doing. Meaning comes from within the person and does not *depend* on external factors. Some people find meaning in meditation where they seem to be literally outside of their own bodies and "out of touch" with physical surroundings, ideas, sensations.

Stephen Toulmin likens scientific processes to map-making. Theory is to nature as a map is to a landscape. The one can never show all of the complexity - and the unity - of the other. (A map which could show everything would *be* nature itself.) Theodore Roszak points out,

> *"We forfeit the whole value of a map if we forget that it is* not *the landscape itself or anything remotely like an exhaustive depiction of it. If we do forget, we grow rigid as a robot obeying a computer program; we lose the intelligent plasticity and intuitive judgment that every wayfarer must preserve....*
> *... to mistake maps for landscapes is to degrade every other way of knowing the world's terrain into some sort of illusion, and in this way to close off the richest source of joy and enlightenment in the personality. Then we forget that to map a forest means less than to write poems about it; to map a village means less than to visit among its people; to map a sacred grove means less than to worship there. Making maps may be absorbing and useful; it may take enormous intellectual talent and great training; but it is the most marginal way of knowing the landscape."*

Roszak writes of the need to develop a sense of, as he calls it, "rhapsodic intellect." As we now practice science, we close out too much experience and thus distort what we study. What comes out of present-day science "does not add up to a life-enhancing natural philosophy." Further, as Seyyed Hossein Nasr wrote,

> *"... science must once more learn to contemplate nature not as an independent domain of reality but as a mirror reflecting a higher reality, a vast panorama of symbols which speak to man and have meaning for him."*

If we take a more contemplative and less manipulative approach to nature, and if we readmit subjectivity and personal experience where it has now been replaced by excessive worship of the *myth of the objective consciousness,* then we will work less fast, we will cover less ground. Our knowledge will *increase* less rapidly. But, as Roszak affirms,

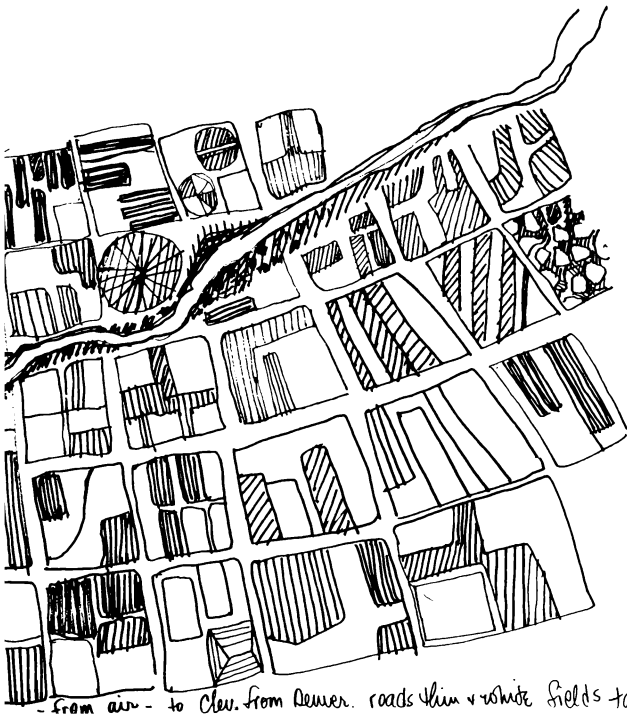
> *"It would subordinate much research to those contemplative encounters with nature that* deepen... *knowledge."* (emphasis added)

Roszak recognizes that, in order to achieve this deepening of meaning, we change the

> *"fundamental sensibility of scientific thought - and doing so even if we must drastically revise the professional character of science and its place in our culture.... Rhapsodic intellect would slacken the pace and scale of research to a degree that would be intolerable by current professional standards."*

Perhaps, through a kind of science that rejects objectification in favor of a more subjective, more personal approach to nature, we can find greater meanings. Science might have its overall status in our culture lowered if we took this approach, but, as Roszak puts it,

> *"Science never deserved to stand on the cultural pinnacle it now so gracelessly occupies; it will find itself a more becoming human activity once it steps down from that summit. As a human skill it is as worth pursuing as any; but its product, unless integrated into an ideal of rhapsodic intellect, has nothing to do with what gives life meaning."*



- from air - to clev. from Denver. roads thin + white fields tan + green fading at top. only pattern, but on landing. texture + depth of trees. houses. water and white houses + roofs bright spots

SOME COMMENTS ON TACIT KNOWLEDGE

There are many ways of "knowing." The most common kind of knowing that schools and teachers and scientists recognize is knowing that can be verbalized and that derives mainly from rules. T. S. Kuhn, in his postscript to *The Structure of Scientific Revolution*, provides an analysis of this kind of knowing, which constitutes the main basis for what he calls "Normal Science." Scientists form communities in which standard ways of looking at problems develop. There is even agreement on what kinds of things are permissible questions. Students learn science and learn to be "scientists" by learning from examples (*exemplars*, as Kuhn calls them). These are,

> *"concrete problem-solutions that students encounter from the start of their scientific education, whether in laboratories, on examinations, or at the ends of chapters in science texts."*

These things show them how they should do their jobs.

Often, scientists and scholars in other disciplines as well believe that a student "cannot,"

> *"solve problems at all unless he has first learned the theory and some rules for applying it. Scientific knowledge is embedded in theory and rules: problems are supplied to gain facility in their application."*

As students work with scientists and science teachers they are conditioned so that they assimilate, "a time tested and group-licensed way of seeing."

On the other hand there is a whole level of knowledge that cannot be verbalized. A fit analogy might be the difference between voluntary muscular activity and involuntary action (autonomic activity) such as the beating of the heart, breathing, and other bodily functions that occur without our willing them or being able to control them in any substantial way. (This is not to suggest that it is not possible to *learn* to control heartbeat, breathing, and consciousness as the hero of Heinlein's *Stranger in a Strange Land* learns to do, and as some people can already do to a very limited degree in certain states of meditation and through monitoring of brain waves.) These are things we learn not from a rule or a textbook but that become an integral part of our being. When we receive a stimulus, we respond by having some kind of sensation. A given stimulus may produce very different sensations in different people. What happens in between receipt of the stimulus and recognition of a sensation within us depends upon an interaction of all of the factors that have ever affected us. Among them are education, culture, language, and experience. What goes on between stimulus and sensation is a mystery. It is a zone of *tacit knowledge*, a vast reservoir of things that are involved in the act of perceiving something. As Kuhn puts it,

> *"What makes the integrity of perception worth emphasizing is... that so much past experience is embodied in the neural apparatus that transforms stimuli to sensations."*

Perception is organic within us and we cannot now verbalize or explain it. It depends on our *tacit* knowledge. Interpretation, which follows perception, departs from rules; it is a conscious intellectual process and begins where perception ends. According to Kuhn,

> *"The two processes are not the same; and what perception leaves for interpretation to complete depends drastically on the nature and amount of prior experience and training."*

Interpretation is,

> *"a deliberative process, by which we choose among alternatives as we do not in perception itself."*

In the deliberative processes,

> *"we do seek and deploy criteria and rules. We try, that is, to interpret sensations already at hand, to analyze what is for us the given."*

Whatever it is that is built into, or programmed into, our neural apparatus (as Kuhn puts it),

> *"... is subject to change both through further education and through the discovery of misfits with the environment."*

This is knowledge, all right, but,

> *"... we have no direct access to what it is we know, no rules or generalizations with which to express this knowledge."*

People develop ways of viewing physical situations rather than departing from rules or laws.

> *"That sort of learning is not acquired by exclusively verbal means. Rather it comes as one is given words together with concrete examples of how they function in use; nature and words are learned together. To borrow once more Michael Polanyi's useful phrase, what results from this process is 'tacit knowledge' which is learned by doing science rather than by acquiring rules for doing it."*

INQUIRY, DISCOVERY, AND THE CURRICULUM PROJECTS OF THE SIXTIES

"Inquiry" is one of the bandwagon words that get adopted in education every now and then. At first such a word is associated with a fairly definite kind of approach and has some more or less definite meaning. Then, when it "sells," nearly everyone picks it up and tacks it onto whatever is being done, often with no real modification of the older programs. "Inquiry" then just becomes the "in" title to apply to all activities. Each educator using "inquiry" techniques redefines inquiry in his own terms. Opponents set it up as a straw man which they proceed to knock over with no particular regard to the range of functional ways in which this new concept is being applied or even whether any change has been introduced other than the change in names.

Technically, any time anybody is asking any sort of question, a kind of inquiry is taking place. Educational systems have always been based on the asking of questions. The locus of question-asking may vary greatly. At various extremes questions may be posed by teachers only, by students only, or by books and programs only. Usually there is a mix of teacher-originated, student-originated, and curriculum-originated questions. Any attempt to answer questions is part of inquiry, even if the attempt only involves leafing back two pages to copy out an answer to a "problem set."

In his presidential address to the National Association for Research in Science Teaching, Francis X. Sutman deplored the confusion attached to use of the word "inquiry." He pointed out that authors who use the term fail to define it carefully even though they have written whole books about it. He went on to try to examine ways in which the term has been associated with various practices. He ends up defining inquiry as the asking of questions *by students*. "Discovery" he defined as the obtaining by students of answers to the questions asked. Further, he states, "the combination of the two strategies produces process-oriented teaching."

I have to plead guilty myself to ill-defined use of the term "inquiry." In the preface to this book I have already mentioned something about how the title of my earlier book *Inquiry Techniques for Teaching Science* originated. The "Inquiry" title was selected so late in the publication process that I didn't even have a chance to go back and place the word "inquiry" in appropriate parts of the introductory chapters. I had used the word "discovery" in most places - a word which I didn't use much better, however, in terms of its bandwagon, ill-defined connotation.

In my mind, I find the concept of discovery inevitably associated with the idea of inquiry and so I shall try to treat the two together. By way of beginning I shall go back through the way that I first approached "inquiry teaching" myself. For the most part, it is a story of gradual movement in a direction which various other science educators labeled as "inquiry." My response was, "O.K., if that's what you call it, it suits me fine. The word has a kind of nice ring to it." In other words, "inquiry" for me was at first a label that other people, the classifiers, attached to what I and others were doing intuitively. I didn't learn all about "inquiry" and then make a decision to implement it as such.

While I was a graduate student in geology, certain of my teachers attempted to help us learn in ways that I found particularly useful. Even though virtually all of them conducted extensive sets of lectures, which are not generally considered by most educators these days to be part of an inquiry approach, they all conducted laboratory sessions as well. Even in some of the so-called lectures, elements of inquiry were present, however. Every time a series of questions was initiated that led us through one or several channels of reasoning to arrive at one or several answers we were engaging in "inquiry." Sometimes the discussion was directed but at other times it was left open so that we could argue at length and perhaps even discover at the end of our discussion that there *was* no single acceptable answer. Any dialogue which involved several questions and answers back and forth between students and teacher, students and students, or teachers and teachers was a sort of inquiry. The kind of dialogue that follows the presentation of a technical paper or of any scientific information at a professional convention, meeting, seminar, or symposium is inquiry that has as its goals the clarification of points, the extension of knowledge, the insertion of new hypotheses, and the critique of lines of reasoning. All of these are part of the general task of science in general and of science education as well - extending knowledge about our world. In science education, ideally, learners have an opportunity to practice their inquiry in progressively less guided ways until they are finally "on their own." The biggest points of controversy are how soon various professional scientists think that people *can* be on their own and also how far out are the questions and ideas that the professionals are willing to admit for consideration by "science." Some of the professionals, and especially some of those in positions of relative power in the scientific establishment, reject some questions and types of questioning as "unscientific." Many science educators draw definite boundaries beyond which they choose not to let their students wander.

Gradually my teachers and advisors guided me and checked my performance, finally certifying me to be "on my own" to pull together a major study of my own - a thesis. This, too, was carefully checked over in both its form and substance to be sure that it was "satisfactory" from a science point of view - as defined by my thesis committee.

The same kind of graded approach to independent activity is used in many single courses as well. After a student "proves himself" able to do "acceptable" and "careful" work as defined by someone representing the establishment (a teacher in this case) the student may

be allowed to do an independent study.

The progression is usually from a guided, supervised kind of question-asking and answering to inquiry in which the student is allowed greater responsibility for setting up his own questions to work on.

My experience as a graduate student and as a teaching assistant convinced me at that time that hands-on laboratory approaches were the most useful ways I had found of both learning for myself and of conveying information to others. One approach to laboratories which I found undesirable was the work-book approach which involved mere repetition of terms and vocabulary drill or classification where answers were final, dull, and were ends in themselves rather than leading to further discussion. Anything that terminated with an answer on the page was not really a very worthwhile outcome, I felt.

Charles Gilbert and Mark Christensen at Berkeley were pioneering a new kind of lab approach in the late fifties and early sixties. They were preparing a manual, but the exercises involved a great variety of approaches, and most of the questions posed ended up leading to more questions and to open discussion rather than to closure and ending of the experience. This seemed to me to help people more in the learning process and to lead to a more exciting and open feeling in the laboratory.

I went off to Syracuse University determined to introduce a similar approach. One of my first assignments was to work with a group of secondary school teachers in a course called "Methods of Earth Science Teaching." I became intensely involved with a number of earth science teachers who shared my values about hands-on approaches. Bob Kilburn was using the phrase "activities approaches" for these, and I quickly adopted this as a useful descriptive name. We were all looking together for new approaches, with each person bringing in new ideas that we tried together each week. We became inventors and the process we engaged in involved a level of inquiry far beyond that of any normal "courses."

We began to move this approach into the elementary geology courses at Syracuse and also into several of the local junior high schools. With larger groups using *our* exercises rather than smaller groups exploring essentially new activities, a kind of formality began to creep back in. Much of the *feeling* of inquiry we had experienced faded. I felt the return of a routineness not dissimilar from that in any lab-manual approach.

We put our collections of lab exercises together into a lab manual. Interestingly, as soon as the manual appeared, fossilized in print, it seemed to be less useful than it had been as a bunch of dittoed materials and stuff written up on the blackboard. Somehow the putting of the material into such a formal shape as a book, with each person required to tear out and submit pages of answers, led us away from the excitement of the new. We experienced this same sensation later when we produced the Earth Science Curriculum Project materials. Someone said to us after the final version came out, "The biggest mistake you ever made was to put it into hard cover!"

Several of us were using the term "discovery approach" a lot at that time. Our students progressed through a set of somewhat prescribed steps and, *bang!* they were supposed to stumble onto a significant discovery we had programmed along the way. We tried to fix it up so they could make these discoveries in a two-hour period without having to make all of the mis-steps that had made the original discoverers spend weeks or years of hard work to arrive at the same point. The trouble was that the process of going through all of those mis-steps had been where much of the enjoyment was for the original discoverers. The discovery itself in many instances was merely a capstone in a long, frustrating, but ultimately joyful process which the original investigation involved. We suffered under the delusion that going through prescribed sets of steps, cold, at scheduled times every Wednesday from 1 to 3 would lead to joy of discovery. Perhaps without initial frustrations there can be no *real* joy!

Lots of people began accusing us of forcing all students to "rediscover the wheel" in ways which were not "normal" in any case.

We did everything we could to set the stage for these lab activities. We set up "pre-lab" and "post-lab" activities to try to create conditions that would induce motivation in our students. Lectures and discussions were keyed to the activity of the week, so that the terms "activity-centered, guided discovery approaches" began to be a pretty good description.

At about the same time, numerous science curriculum projects for the secondary schools were being set up through the sponsorship of the National Science Foundation. These began with the PSSC in 1957. The program produced by PSSC introduced a heavily activity-centered approach to physics teaching. The intent of the PSSC group was also to introduce more real rigor and a more bona fide "scientific" quality to secondary school physics. The dictum of the day was Jerome Bruner's idea that you can teach any concept to a person of any age in an intellectually honest way. Bruner was merely expressing his faith in the incredible potential of human beings. However, the way in which this idea became a basis for development of curriculum materials in the NSF projects proved to introduce many negative factors as well. Senior scientists saw this as a license to get their favorite obscure concepts moved down into the secondary and even elementary schools. True enough, some children were able to handle virtually any concept that was introduced (and, interestingly, these were not always the "brightest" children). By trying to run *all* children through a set of exercises, regardless of their interests, however, we were back in the same old problem that has always faced single-track classes. *No* exercise ever can fit the needs and interests of all students in any assigned group at the same time.

During the years after PSSC physics was introduced, the enrollment in secondary school physics programs dropped drastically. It would not be fair to say that this drop was caused

by the introduction of PSSC physics. Students who succeeded in the program came out with a broader and deeper knowledge of physics than perhaps ever before. The quality of the product was up, but the numbers of interested people fell. College physics departments have likewise been faced with falling enrollments. During the last few years, new physics programs such as IPS and Harvard Project Physics have attempted to reach more people with a greater variety of approaches.

Following PSSC came dozens of other NSF-sponsored programs, each with a strongly disciplinary vested interest related to the tightly defined interests of the professional scientists who wrote them. These included CBA chemistry, CHEMStudy, BSCS, ESCP, SAPA, ISCS and others.

SAPA, a program for elementary-school science, shows use of the term *Process Approach* which has been much used as an integrative approach involving both *inquiry* and *discovery*. The idea is that even though we greatly abbreviate the scientific process and guide people closely through to what we want them to know, we still do this with emphasis on the process of gaining knowledge as well as on the product. In many instances this becomes a parody. In attempts to get to the product - the "main idea," the terminology, and the other "normal" cognitive values that schools have emphasized for years and years - the students are pushed through useless manipulations identified as a "process approach" just because it's the thing to do. More and more, I hear from students involved in such programs, "Why go through all this nonsense? You have some definite things you *do* want us to get to, so why not just give them to us directly?" We almost insult them by manipulating them through activities that many students in any group perceive as uninteresting. Then we grade them on multiple choice tests based on definitions, classifications, and factual material that they could have learned by heart (and will remember no longer, as many studies begin to indicate) in one-fourth the time.

I am especially sensitive to this now that both of my daughters have been through both the BSCS and ESCP programs in different schools and with different teachers. Not only that, but I encounter increasing numbers of college freshmen who have been through the new science programs and are still "turned off" to science just as they were before the new programs existed. Gretchen's New York State biology regents examination last month was the epitome of triviality as I know about it. Furthermore, her teacher allowed almost no lab work. In many cases teachers are so conditioned to lecture-discussion-oriented classrooms that new curricula make little difference in their classrooms. People don't change as the result of using a new book or program. If they're going to change in their way of operating they will do this regardless of the instructional aids available to them. Significant functional change does not, in my experiences, come through curriculum. It comes only through changes in the relationships among people in the educational environment.

In the summer writing conferences of ESCP we worked in an exciting, inquiry-oriented environment similar to the one I had experienced with the first earth science methods students I worked with at Syracuse. Electricity sparked through the air as we all committed ourselves to an intense experience of creation. We hoped that junior and senior high school students would experience at least some of the excitement we felt in putting the thing together.

In Syracuse, one of the main testing centers for the new experimental version of the Earth Science Curriculum Project materials, we had a group of five local teachers, Dale Hesser, Bob Daley, George Ladd, Bill DeLucia, and Larry Parsons, myself as college consultant, and about five hundred ninth graders involved. Through Roger Ming we got the New York State Education Department on our side and worked closely with them in something that we hoped would eventually sweep the state. (It has now, somewhat to my chagrin as I view it from my present perspective: one set of rigid approaches replaces another set of rigid approaches!) Our operation at test-center meetings was exciting, too. For the two years of testing we thought of ourselves as creators and inventors rather than as consumers of a curriculum. Our test-center group turned out to be one of the most significant contributors of new ideas and approaches to the central curriculum production group because we *did* view ourselves as inventors. Other test centers merely used the materials as they came in, showed low vitality, and contributed little to the revision and creation of materials. All of our test center members went on to positions of much greater influence in their systems and are still active developers and innovators. We also called upon the junior high school students in our group to help in the invention process, and I believe there may have been much more excitement in those classrooms than was customary. I attribute this to the fact that all of us in the test center thought of ourselves as doing something really important for a change. We weren't *just* teaching, running a "test center," or studying earth science. We were all partners in an enterprise of creation. That's where most of the really high-level inquiry was, *not* in the materials themselves but instead in the way in which we were interacting with each other. The important process going on was one of working together to solve new problems rather than going over the old ones. Much of the time we didn't know how various things would turn out, if equipment would work, what new questions would arise, and how we would respond to each other in various situations.

The State Education Department followed our activities closely, and we were called upon to lead workshops for teachers from other parts of the state in preparation for the organization of a new state-wide curriculum to be based on our "Inquiry" approaches.

It was at some time during that period that I began to use the term "inquiry teaching" a good bit. Actually "guided inquiry" is more accurate. We were still inventing ways to provide students with short-cuts to the scientific process. In this way we were conveying an erroneous notion that left out too much of the heartbreak, frustration, and hard work of investigation and

made the processes still seem cut and dried and with easily predictable and testable results lying at the other end of a comfortable and tidy tunnel. All you have to do is go down the tunnel, and at the other end you'll find the joy of an answer. All many of the students found at the end of their endeavors was a big, "So what?"

A year and a half of full-time research activity centered around a stay at the Geological Museum in Oslo during 1967-68 may have had a much stronger effect on my own movement toward "open" education and student-centered inquiry than I realize even now. For the first time I was involved in full-time, honest-to-goodness, scientific inquiry. In Ph.D.-thesis-days I always had it in the back, and often in the very front, of my mind that my product had to please a thesis committee, had to be judged satisfactory by them before I could get my degree. If they didn't *like* me or if my work didn't meet some nebulous (to me) expectations of what "a good study" ought to be, they could, as it were, cut me off from my goal - to teach in college. They could delay me, too. So there was the whole question of optimizing - cutting corners where I could to produce something to satisfy someone else.

My geological research at Syracuse had been honest "scientific" inquiry, I think, but much of it had been in collaboration with others. I do not deprecate this fact, but I didn't have quite as much a sense of "my" work as I did in Norway. There I didn't need to compromise with anyone about anything. I could do it entirely my way and take full responsibility - with no real penalties that bothered me on the other end.

As I write this I am interested to see how I still dichotomize my own work. I just wrote about most of my "real" inquiry at Syracuse being in collaboration with others. I have left out my science education work when I write that. In the area of science education I have had a much greater sense of "my" contributions, a great "feeling good" about both the process and product. And yet, for some reason, that trace of prior conditioning says to me that the contribution of a concept on the origin of a group of obscure rocks has higher status than a contribution to education - that may affect thousands of people ultimately! Yet at the same time I think of the particular joy I have felt in working with science teachers who are "hungry" for ideas. I always had the feeling that something we came up with in our science teacher seminars and labs, especially with in-service teachers, might be tried out the very next day with several hundred junior high school students.

The only possible penalty was that an article I might write could be rejected. I have discovered, however, that a "rejection" doesn't necessarily mean that my work is *bad* (nor, on the contrary, does an acceptance mean it is good!). My work simply *is*. A rejected article sent without changes to another journal or editor may not only be accepted but may even receive general acclaim from all but the original rejector. Even the original rejector might have accepted it on a different day and in a different mood! Some of the things I have done in science education that I like the most and that have had what I feel is a particularly good effect in stimulating discussion and controversy have been things that were tried with several editors before they ever got into print. So I didn't feel at the time I was in Oslo that rejection would bother me. I was studying what I wanted to study, in the depth that I wanted to study it. I was writing things up when I wanted to and in the way I wanted to. Perhaps then I really began to feel that *this* is what *inquiry in hard science* is really like. (As described above, I began to get the same sense from those electrical experiences of creation with secondary teachers and with the ESCP writing and testing groups.)

So it comes down to this: I achieve a really satisfactory *level* of inquiry for me in either an educational or a "hard" research context only when I am dealing with something that I have adopted as my own and in which I feel freedom from penalties if my inquiry produces no particular product. I enter such an inquiry with a *hope* of getting something concrete out of it in the sense of data or a paper, or a talk, or something to communicate with others about. But if the inquiry turns out to be "just messing around" in the sense of exploring and experiencing, then I accept that too as a valid and possibly high-level form of inquiry. I am just now getting to the point where some data gathered and ideas generated many years ago may be ready to hatch. Many experiences I have will never come together with others to make up a product. They are nonetheless parts of the overall process of inquiry (questioning and perceiving) that is an integral part of my existing.

Inquiry is not confined to science, incidentally. My inquiry leads me into music, philosophy, art, eating, sleeping, and all aspects of my knowing and experiencing. It is a pervasive part of my organism. When I cease to inquire I cease to exist. I refuse to limit the notion of inquiry anymore to activities organized according to someone else's extrinsic rules of "scientific method" or whatever other organizers.

David Hawkins once wrote a delightful article entitled "Messing About in Science." This article spelled out a lot about the approach of the Elementary Science Study (ESS) of which Hawkins was director at the time. Hawkins' idea is that without a pretty random kind of messing about first, elementary school children simply will not commit themselves to any "significant" work of a more "rigorous" and directed nature. Many of the ESS science units are designed as invitations to mess about and to play with. I extend Hawkins' notion clear up through adulthood. In general I feel that people of all ages are as likely to arrive at a commitment to work in a directed way, through *play* or messing about as in any other, more directed way, and perhaps more so.

Barry Stevens discusses the formulation of problems. She says that sometimes she begins to pursue an idea through formulating a problem first, but that she doesn't necessarily

have to have a problem *first*. In the course of normal living she runs into problems. I like this idea. I am surrounded by potential problems that constantly invite me to deal with them - to make an inquiry into them - if *I* choose to do so.

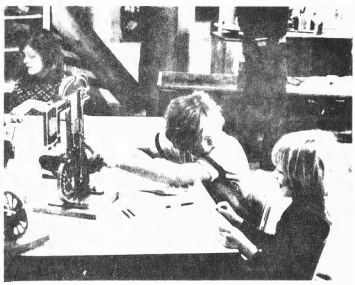
When I began work on my Ph.D. thesis I hadn't the remotest idea what to start with. Yet the "scientific method," as unfairly and naively defined by most people who are silly enough to try to define it, specifies that we have to specify a problem *first*. I went around to various faculty members and each of them refused to make the decision for me. Finally I elected to take an unknown area in northern California, adjacent to areas where other graduate students were working, and try to see what I could "get out of" the area - a very ill-defined "problem" if ever there was one. When Charles Gilbert, my committee chairman, came to visit me several weeks after I had begun, we sat down together one afternoon of top of Etna Mountain and talked about my getting a better defined problem. Looking out over hundreas of square miles, he said, "Anybody who can't go out into an area like this and find a problem worth spending time on must just not be very interested or perceptive." He was inviting me and encouraging me to explore, experience, mess about, and then focus as focussing became appropriate.

I should point out that the "messing about" approach to scientific studies isn't necessarily shared in quite this form by many scientists. As I talked one evening with Harvey Blatt, he described his way of sitting in his office and staring at the corner of the room, just reflecting, for two or three weeks at a time, perhaps, waiting for a problem to come to mind. He felt that messing about in the lab or in the field was a waste of time and didn't lead to anything significant. I would counter that he was himself involved in his office in the same kind of "messing around" behavior, but that he was entirely in his head. I prefer, for me, to let the stimuli flow in from a more active kind of experiencing than I receive from the wall of my office or lab. I can accept, however, that others may well function better from a more abstract, staring-at-the-wall position. This acceptance, then, will affect the way I work with other learners.

I used to worry, "What'll I work on when I'm done with this study? Will I be able to think up a new problem?" If I am really operating as an inquirer, if I am perceiving what is around me and flowing with it, if I am aware of what is going on inside of me and around me, problems will be there ready for the plucking. If I am used to having people guide me and make my own decisions as is true in the guided inquiry of most conventional schools, I will have a hard time dealing with my own life later, when no one else is willing to take responsibility for me anymore.

Inquiry then, as I mean it in this book, is a continuing and wide-ranging exploration, question asking, and experiencing (sometimes even a very passive-appearing and reflective kind of experiencing) of the world around me and around each learner I work with. An inquiry environment is any part of the world I live in that invites exploration without penalty, that demands my involvement by its very excitingness. Inquiry that is limited by guides and constantly planned excursions for me limits my exploration and my experience. By this I should add that I mean *required* excursions. Excursions that I plan myself or on which I accompany someone else because I choose to are valued parts of my inquiry environment.

To Frank Sutman's demand that I define what I mean by inquiry I submit the above paragraphs. However, I leave the real definitions of inquiry, discovery, and process open to each individual learner I work with. Inquiry to me is an intensely personal infinity of routes through all possible combinations of experience. To define it any more precisely than that and to hold to any fixed definition is to place unacceptable limits upon it. In real inquiry the ultimate locus of my questions is within myself.



OBJECTIVES: ENTER *THE AFFECTIVE* AND QUESTIONS OF PERSONAL RESPONSIBILITY

"Responsibility for learning and growth rests finally with the individual. We can reshape the environment to remove obstacles. We can stimulate and challenge. But in the last analysis, the individual must foster his own development. At any age, the chief resource must be the individual's own intent, drive, and enthusiasm."

-- John W. Gardner

In *Inquiry Techniques for Teaching Science* I left out discussion of affective aspects of the classroom. It had not dawned on me that additional objectives - relating to growth in the so-called *affective domain* - needed to be spelled out. I assumed that teachers and students would work out satisfactory personal relationships in a natural way. The teacher had a responsibility to set up subject matter and behavioral objectives for students to meet. The teacher was to be a guardian of an academic discipline. Learning the subject matter of science and becoming "interested" in science seemed more important in a science class than anything else. I assumed that I could *make* science so interesting that, in the long run, no one could resist it (me). This is what might be called the "pied piper complex." Give me enough time with any student and materials and *I'll get him interested.*

How could I be sure that students had learned what I wanted them to learn if I had not set up a set of detailed objectives? I felt accountable for the student's learning. What I found out was that students often didn't learn the things that were important for my goals but they did learn things of equal or greater value or worth to them. Reg, for example, took a "gentleman's C" based on my objectives for a geology course. That summer he wrote me a long letter and enclosed a clipping of an article on gravel deposits in his home town. He had published the article, a very well-written, knowledgeable, and "scientific" account, in a newspaper for which he was a reporter. Reg's work was worth anybody's A, but I had held him responsible for a different set of goals than his own, and set a meaningless time schedule (fifteen weeks).

Trying to take responsibility for all of those students was a hair-raising experience for me, too. I worried a lot about the fact that I wasn't getting *it* across. Warren Yasso, after he had begun to take a student-created approach to science education, wrote the following:

"Four graduate earth science courses at Columbia Teachers College have made all conventional lectures, films, field trips, preclass readings, and discussion groups entirely optional. The only required activities for the 25 or so students enrolled in the courses each term are several 15-minute interviews each term and a series of progress reports. The interviews are to help students identify areas of interest, document progress in library research and laboratory-field skills, and, in the final interview, to review accomplishments and discuss a final grade, which is totally student-determined. The progress reports take many forms: oral reports, demonstrations during class time on a sign-up basis, short written reports, field reports, multi-media presentations, etc. Each student keeps a progress folder and files a statement of intent about what he will do until the end of the semester. The students much prefer a statement of intent to a contract.

The teachers and I have experienced a heightened interest in subject matter. The hope is that in "humanizing" courses the spark of enthusiastic scholarship will be kindled in a greater number of students, and this hope seems to be borne out. The students' passion often rubs off on me. I would suggest that significant learning takes place only when *the student is working on a problem meaningful to him. The fact that student-assigned grades were much better than grades I would have given is a small price to pay for the increased enthusiasm. If anyone were to ask me what the greatest benefit has been in the Rogerian approach I would reply that it is my psychological relief in not feeling obligated to drag the students through an arbitrary and overfull course content. I'm sure that this lack of content-transmitting frustration will add years to my life."*

This is a time during which behavioral objectives - also called performance objectives - are becoming more and more the rage, with all of today's stress on accountability. I started out as a strong advocate of behavioral objectives, but I now find my former views incompatible with a confluent, student-centered approach to learning.

One trouble remaining is that I now have to work in a larger context that strongly values behavioral objectives, a context that I even had a small role in creating. Since so many people are now infatuated with these I wonder if it might be advantageous to "join 'em" rather than fighting them. In so doing, we may just be able to beat them! The strategy is to work toward acceptance of high-level objectives where the responsibility of the learner himself is stated as of paramount importance. Teachers can formulate a whole set of apparently tight objectives in such student-centered terms that a state education department, curriculum committee, school board, or board of trustees might just accept them and legitimize the most confluent kind of school. Such objectives could begin with a statement something like the following:

"At the end of this set of experiences the student should be able to set his own objectives, modify these as seems appropriate during the course of his investigations, pursue appropriate reading, and investigations as determined by himself, in consul-

tation with teachers and peers, evaluate his own work periodically, and communicate results in a way that he and the community he works within feel appropriate. He should be able to communicate his feelings for what he is doing and whom he is working with. He should show the ability to reject relationships that are unsatisfactory to him and to continue with satisfactory work and relationships. He will be able to demonstrate these behaviors through periodic communication with teachers and peers and the publication or display of his products to the community at large in ways that he and the learning community shall establish."

The specific subject-matter objectives can then be written *after* the learning experience is completed. They can take the form of a chronicle of things that really happened rather than a list of phony expectations which might have destroyed spontaneous and ultimately fruitful approaches to both science and living. If science is approached as a process and as an evolving process at that, rigidification of method or subject matter is potentially damaging to both science and to people.

Objectives written in student-centered terms are actually more rigorous than any of the simpler level objectives I described in *Inquiry Techniques for Teaching Science.* They not only allow, but they demand negotiation, continuous re-evaluation and the development of relationships. The development of attitudes and feelings is both implicit and explicit.

I have a confession to make about the behavioral objectives in the ESCP program. In 1964 the writing teams were already well into preparation of the first draft when Dick Smith, John Merrill, and I "discovered" behavioral objectives through Mager's now famous book, *Preparing Objectives for Programmed Instruction.* We thought this so relevant that we urged our fellow writers to specify detailed behavioral objectives. Eventually, the three of us went back, read over the chapters, and abstracted what we thought *ought* to be the instructional objectives for all chapters. Note, however, that none of the chapters were *written* with these objectives in mind. We wrote the curriculum first, letting our own intuitive flow direct the writing. It was only much later that we analyzed the chapters to find out how we must have written them and what our objectives must have been. Our objectives were not "objectives" at all! They were *results of a process of flow.* The cart was squarely before the horse from a behavioral-"objectives" point of view.

In summer of 1975 I helped write some curriculum modules for the Human Science Program of the BSCS. Jack Carter, who led this particular writing session, specified at the beginning that he wanted us not to get hung up in objectives but rather to write curriculum units that seemed exciting first and to leave the writing of objectives to later analysts. Meanwhile, in order to satisfy the accountability people, they are proceeding to write these objectives out. Will teachers try to use these objectives as a means of controlling their students? I hope not.

In a review of *Risk-Trust-Love,* Hans Anderson wished I had said something about emerging models of science education programs such as The Mastery Learning Model. This model involves the teacher as a diagnostician-prescriber-organizer. But, in a sense, Hans presents in a later sentence of his own a shadow of my reason for rejecting models such as The Mastery Learning Model. He writes, "Of course, in considering The Mastery Learning Model we must ask, can teachers and adults be trusted (Romey's word) to select objectives for students." My emphatic answer to this question is *NO.* When I set specific objectives relating to science content and skills, monitor the learner's progress towards these, prescribe routes for him, and organize things for him, I deny him the independence which lies at the very base of sound scholarship and of the growth of science.

I accept that a learner may be influenced by the things I value. He may choose to try some of my work habits. He may seek references from me. He may ask advice about how to limit a study, how to expand it, ways of pursuing it, how to use equipment. We may choose to work together closely as partners. I may invite him, or he may ask, to act as a research assistant to me, or he may just hang around and watch me. I will insert my energy into the system in many ways.

The thing I will not do is to make a decision for a learner, inasmuch as I can avoid doing so. I will not *set* an objective *for* a learner. I will be willing to discuss objectives, to give my opinion of them and to help work out routes of approach as any collaborator or colleague would do.

I will admit, as Hans aptly points out, that I do have very definite and high-level attitudinal and "behavioral" objectives for learners. But the difference between the usual teacher domination of the process of setting objectives for learners, for being accountable for the learner's reaching those objectives, and my giving the responsibility as completely as possible to the learner himself is not just a matter of semantics. It is not just a minor shift in emphasis. Make no mistake about it, it is a complete overturning of what is the intent of any accountability scheme based on performance objectives as these are commonly understood in Mastery Learning or other teacher-dominated models. I reject accountability *for* the learner, his goals, and his progress toward them. The nature of life itself is that each person ultimately chooses what he is going to do (even if this is to obey someone else). Each person *is* accountable, *himself,* for what he ultimately does or does not do. He is accountable to himself and to the society around him, for it does have the power to crush him or at the least to incarcerate him. When I pass responsibility for goal-setting and goal-attainment to the learner all things that I do in the learning environment are affected by this transfer.

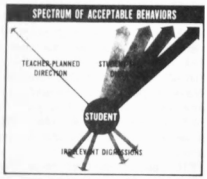
The difference is of the same type as the differences in levels of consciousness being explored so ably by people like Charles Reich in *The Greening of America.*

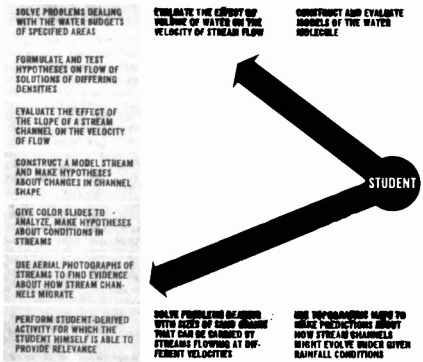
Meanwhile, from a practitioner's point

of view, a teacher, student, or administrator can get around the apparent restrictiveness of performance-based objectives. These are only inhibitory if we waste energy in fighting them. In the long run, they are a passing fad, and they end up so cumbersome when applied at a specific level that the system founders under its own weight: a dinosaur so cluttered with check-lists and pencil lead that he won't get very far.

It can even be fun - a game - for teachers, students, and administrators to write their objectives up *after the fact*, after the fact, in the form of a journal. Higher-level administrators or would-be controllers never need even know that today's lesson plan filed in the office actually describes what went on yesterday or last week. As a matter of fact you can even redefine performance and behavioral objectives into terms where they help you develop greater awareness of what you have learned. They can become reinforcers: "Hey, I didn't realize I could do *that*." They need not be advance organizers that elicit the response, "Gee whiz! Do I *have* to do that?"

If performance objectives seem to be an obstacle, use them in a different way. The only person who can trap you in a performance objective is you.




SOLVE PROBLEMS DEALING WITH THE WATER BUDGETS OF SPECIFIED AREAS
FORMULATE AND TEST HYPOTHESES ON FLOW OF SOLUTIONS OF DIFFERING DENSITIES
EVALUATE THE EFFECT OF THE SLOPE OF A STREAM CHANNEL ON THE VELOCITY OF FLOW
CONSTRUCT A MODEL STREAM AND MAKE HYPOTHESES ABOUT CHANGES IN CHANNEL SHAPE
GIVE COLOR SLIDES TO ANALYZE, MAKE HYPOTHESES ABOUT CONDITIONS IN STREAMS
USE AERIAL PHOTOGRAPHS OF STREAMS TO FIND EVIDENCE ABOUT HOW STREAM CHANNELS MIGRATE
PERFORM STUDENT-DERIVED ACTIVITY FOR WHICH THE STUDENT HIMSELF IS ABLE TO PROVIDE RELEVANCE
EVALUATE THE EFFECT OF VOLUME OF WATER ON THE VELOCITY OF STREAM FLOW
CONSTRUCT AND EVALUATE MODELS OF THE WATER MOLECULE
STUDENT
SOLVE PROBLEMS OF AREAS WITH NEED OF FLOOD CONTROL THAT CAN BE CORRECTED BY STREAMS FLOWING AT DIFFERENT VELOCITIES
USE TOPOGRAPHIC MAPS TO MAKE PREDICTIONS ABOUT HOW STREAM CHANNELS MIGHT EVOLVE UNDER GIVEN RAINFALL CONDITIONS

PROBLEMS WITH A PREPROFESSIONAL APPROACH IN SCIENCE EDUCATION: SYMPTOMS AND TREATMENT

I just got back from a meeting of department chairmen, May, 1973. As usual, the group wasted an hour and a half with its perpetually on-going discussion about how to make minor changes in the grading system - simple changes in form involving no change of substance at all. Insignificant changes about which they argue for hours on end.

One of the main points of discussion was the grade point average, that statistical horror which adds up points assigned to grades so that an "A" in music added to an "F" in math makes a "C" student! As a group, we had previously voted to get rid of this concept. However, two people raised the issue again, feeling that we should not abandon the concept, because of its importance to students. "Students need grade-point averages to get into Law School," said the one. "Students need grade-point averages to get into medical school," said the other.

This reminded me of a seventh grade biology student I recently spent some time with. She was very apprehensive about her work in science and terribly concerned about whether or not she would be able to get into medical school. *Twelve years old* and developing a mind-set that will undoubtedly have her dealing with a stomach ulcer before she even leaves high school, still worrying about an admissions procedure that she will not face until she is 20 or 21! If she becomes a doctor, I'm not sure I'd want to be treated by her! If law school were the problem, I wouldn't want her handling my legal affairs either.

I see this in science-oriented students, too. Even though our particular group of students are free to set up their own programs, I find great apprehension among those who are aiming for graduate school. Their chief concern seems to be, "Will I get in?" rather than "How do I learn some science because I like science?" I see this mind-set as a learning inhibitor that dulls the perceptions, narrows the views, inhibits the integration of learning and life, increases the chances of bad science, reduces the chances of people's taking significant risks, and therefore reduces their chances of making significant discoveries and creations. Coincidentally, it probably also even reduces their chances of getting into the very schools where they seek entry!

People suffering from acute pre-professionalism (students and teachers alike) are not functioning in the here and now. They are usually partially, and in more advanced cases significantly, closed to today's experiences, so preoccupied are they with yesterday's failures and successes and tomorrow's imagined problems and exclusions.

A fully functioning scientist (including doctors and lawyers) is a person who is as totally open to experience as possible. He is also operating as an empiricist who gets an idea and tries it to see whether it will work as a hypothesis, experiment, diagnosis, treatment, or legal ploy. He also operates from a base of broad experience so that his intuition can generally be trusted, and he is in the habit of consulting with colleagues and cooperating with them in helping to refine and improve the chances of success of his experiments, diagnoses, or legal cases.

Recognition of the disease: the patient appears fidgety and squirms a lot in classes. When asked a question or when given a piece of information or asked to perform an experiment the patient usually asks, "Will it be on the test?" The patient can often be seen poring over college and graduate school catalogs. Observations of the patient's parents and teacher may also prove useful. Parents of the person afflicted are usually highly concerned over grades and grade-point averages. They are inclined to try to force the patient to stay in at night and do science homework instead of playing baseball or becoming involved in other physical and avocational interests. The patient's teacher may also frequently use the phrase, "You'll never get into ----* unless you finish this work and keep up with it." The teacher (and the student, in extreme cases) may be seen to be carrying around and studying old rumpled-up sample questions and preparation booklets for the SAT exams, the GRE exams, the medical school and law school exams.

Treatment: Abandon the grade pressures and exams modeled after the professional-school exams. Surround the patient with young people and adults who are more open to experience. Stop giving homework. Suggest to the patient that he or she get a summer job working in a hospital, law office, scientific laboratory. Help to arrange such experiences. Find some medical doctors, lawyers, or scientists who are themselves mature and open to experience and who operate primarily in the "here and now." Put patients in touch with these people. Invite them to come work with your group from time to time. Try to recognize the disease as early as possible. In more advanced cases psychotherapy and even psychiatric treatment may be necessary.

**(Fill in one or more of the following: grade school, junior high school, high school, Harvard, Indiana Medical School, the Stock Exchange, etc.)*

CERTIFICATION

In *Fantasy and Feeling in Education,* Dick Jones tells how his application for a teaching certificate in Massachusetts received no response. He based his request on the fact that he was giving the teacher certification courses at Brandeis, but did not have "credit" for them. I'm in the same boat in New York. I never went so far as to apply for some kind of equivalency certification, but I'm sure I would meet the same problem Jones did if I applied for teaching credentials.

A big move is afoot now to introduce stringent certification rules for professional geologists who wish to do consulting work. Several states have introduced such rules. In California, there was a time period during which just about anyone doing consulting work had only to register himself. After that it got tougher. Environmental activists in the eastern section of the Geological Society of America got together to put out a directory of people who would be willing to help either for fees or for free with environmental problems involving geological factors. They have been hassling with certificationists and worried legal officers of the society about liability and all sorts of issues. All they want to do is help provide information and access to help, but they're running into walls.

What you know and can do is frequently less important in getting access to positions than the certificate you possess. The certificates are commonly obtained in mechanical ways and indicate little about potential, aptitudes, or interest. They only tell that you have passed through a program.

Sabina was exceedingly bright and perceptive. She was from abroad and was about thirty. We employed her as a secretary and quickly began using her as a staff associate in ES. She decided later to go into a professional training program for radiological assistants. Before they would even consider her she had to take several nonsense courses and "high school equivalency" exams they insisted upon having as certification of her "capabilities."

I recently participated in a group effort sponsored by the American Association for The Advancement of Science to produce a new set of *Guidelines for The Certification of Secondary School Teachers of Science and Mathematics.* We tried to move away from straight-jacket certificate requirements. Our suggestions were for much greater flexibility and greater recognition of "equivalent experiences," but I fear that these will still be reflected in only minor changes in existing rigid programs.

One attempt to get away from certificates based on "course programs" is through the introduction of so-called "competency-based" certification requirements. According to these, you would be required not to show evidence of having taken certain work but rather of having functional ability to perform certain tasks and behaviors. Our own teacher education group is now helping to develop such a competency-based program for New York State. Those can become straight jackets, too, or just the old program, rearranged.

I wonder if they will come up with a program that would allow them immediately to certify say Dick Jones, or me, or Jeeter. Jeeter was a teacher-aid in an inner city school in an eastern city. She worked with us in ES. She is an intuitive facilitator of learning. You put a bunch of elementary school children with her and they learn, they function, they grow. My intuition tells me immediately: this person is worth anyone's certificate. However, Jeeter has several strikes against her: She is a woman, she is black, and she never went to college. I say we have to find ways of just watching Jeeter and others like her work and then signing the certification papers straightaway with no further nonsense about night-school or course work. The Jeeters will continue to grow and learn just because of the people they are. They don't need to have the monkey of formalized course-work on their backs. My intuition tells me that I can vouch for her and that I want her "teaching" kids now, and at full salary!

In one of Carl Rogers' programs for encounter group leaders, they refuse to provide certificates of completion. They want you to go out and make it on your own on the basis of how you actually function as a facilitator, and not on the value attached to your certificate. It was probably easier for me to get a job after finishing my graduate degree at Berkeley than it was for somebody better than I, but from a "lesser" school. I don't like that.

At the other extreme are the people who continue to play the certification game. They attend the appropriate course or go to the "right" schools and even might "test-through" competency-based programs, but my intuition tells me I don't want them working with my children. Maybe we'd better throw away all of those past-history transcripts and exam records and just sit down and see how people function with kids every now and then, on a repeated basis, too. And I want people to sit down with me that way, too, rather than asking me whether or not I'm tenured! Tenure is a shield I don't want. Either I can do it on my own or I can't.

Several of us have been making pleas for a more open approach to "credit" at St. Lawrence and to distribution requirements. My view is that a broad, liberal education is not assured by any combination of "courses" but that, on the contrary, great breadth may be achieved through "extra-curricular" activities even though the formal "curricular" work might appear to be very narrow. A liberal learning experience depends on the overall learning environment, and how I use it, not on any required combination of courses certified by a transcript. Those requirements may, if anything, antagonize learners and end up building blocks and inhibiting breadth. Faculty who oppose us vigorously point to what they call, "The St. Lawrence Experience." The phrase I hear at department chairmen's meetings is, "When students come here, they do it our way."

As if there were an agreed-upon "our" way! What each person who says this means is "my" way. To me a St. Lawrence certificate has no special worth. If it exists so that you can really spot me as a St. Lawrence product instead of as me, uniquely me, then the certificate has become too rigid.

In several open schools I know of staff people have been hired through encounter groups. People desiring positions spend several hours in a group with other staff from the school. We had a model cities program at St. Lawrence involving two hundred inner city children, many from minority groups. The assistants and dorm counselors for this were hired strictly on the basis of extended personal interviews and the gut feelings of the program leaders. No certificates to hide behind - just who you really were!

Michael Atkin, now Dean at the University of Illinois and past president of the National Association for Research in Science Teaching, proposed a similar intuitive approach to evaluating teaching and teachers.

When certificates hide incompetence as often as they do, there must be something wrong with the concept of certificate as we define it. How do you ultimately certify a self-actualizing person? That's the kind of person I want to be, I want to let others be, and I want to hire, work for, or work with. I also want people working in all areas of education *especially* to be chosen for the all-around people they are and not on the basis of cognitively-based credentials.

The number of students taking earth science in junior high school has increased at a tremendous rate during recent years, from a few thousands in 1945 to a quarter of a million in 1963. Curricular materials available by 1958 included a small number of textbooks requiring little more than rote learning of definitions. Classroom practice reflected the questions included in these books. The approach used almost universally involved lecturing, vocabulary drill, and multiple-choice tests. The model of learning in most classrooms was a didactic one characterized by a flow of information from teacher to pupil and by minimal student involvement.

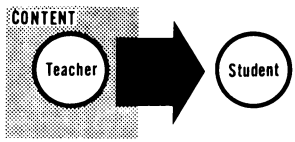


Fig 1: didactic model of teaching. Predetermined content is directed at the student. The teacher's responsibility is to be trained in content background. The student is a recipient of information. The teacher's role is to convey the predetermined content to the student. Importance is placed on information.

One of the main goals of curriculum projects during the 1960's was to move away from this didactic model of teaching. Implicit in this model was the idea that everything worth knowing could be told by teachers and could be learned through listening. Scientists who wrote for the curriculum projects felt that students should become involved in the processes of science, and this gave rise to the phrase "process approach." ESCP went along philosophically with BSCS and the various physical science programs in working toward what was called directed discovery. Teachers, to use ESCP materials as intended, had to become managers rather than information dispensers. A model showing how the teacher was expected to behave with respect to his students in a process approach is shown below - a "managerial" model.

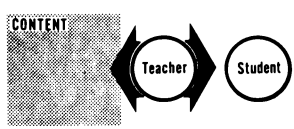


Fig. 2: managerial model of teaching. This approach focuses on the behavioral interaction between the student and predetermined content (commonly emphasizing concepts). The teacher's role is to focus on the behavioral interaction. The student is actively involved with investigating the curricular content.

In ESCP and the other major curriculum-revision programs stress was placed on acquisition of behaviors. The rationale for this shift was that if students were involved on a psychomotor level - doing things the teacher told them to do - they would retain the skills they practiced and would also show greater cognitive gain than in a didactic situation, by virtue of using several of their senses at the same time. Thus each chapter of the ESCP book *Investigating the Earth* was written around a series of behavioral objectives. These state more or less explicitly what behaviors students were supposed to be able to demonstrate when they had finished performing certain investigations and discussing certain questions. An interesting innovation in *Investigating the Earth* was that approximately fifty investigations in the book were written into the text in such a manner that they had to be done in order for succeeding parts of the chapter to make sense. Many of the problems to be investigated were stated only briefly - requiring students to set up their own experimental designs and allowing them to modify the problem to a greater or lesser degree. The more successful ESCP teachers did little or no lecturing and may have had their students spending half or more of their class time doing investigations.

The ESCP teacher's guide emphasized the importance of the structure of the chapters and investigations and suggested that the course be presented without rearrangement. A sample 180-day schedule showed teachers when they should be doing what, if they wanted to "cover" the course; furthermore, each chapter contained a suggested day-by-day schedule, or lesson plan, on how to cover the chapter. Included in the schedule and in the detailed instructions for setting up investigations and leading students in the direction of hoped-for discoveries were suggestions as to how many minutes to devote to pre-lab discussion, how long to let students work, how to help them, when to let them flounder, how to break off the laboratory work, how much time to give to post-lab discussion, and even what leading questions to ask.

Most of the more successful ESCP teachers were able to develop flexibility within this rigid schedule and did not hesitate to depart from both the subject-matter organization and time requirements outlined in the teacher's guide. Nonetheless, much of the teacher-training effort and the very rigidity of the schedule compelled even most "good ESCP teachers" to behave as strict managers and efficiency experts. Students had the advantage of knowing what was expected of them, but they were managed so much of the time that they had few opportunities to make significant decisions, little time to learn from mistakes, and few opportunities to fail. Within the framework of investigations and discussions they had the opportunity to make many lower-level decisions; but even here they commonly were too much hurried to think through what they are doing, how they are doing it, and why they should be doing it - all three being essential

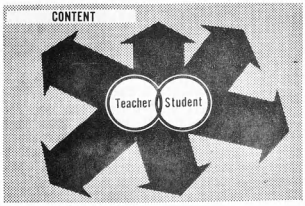
factors in efficient and careful decision-making.

The ESCP staff and many of the successful teachers we identified felt strongly the need for improved teacher preparation along new lines. Having made the transition from didacticism to a managerial approach, we sought ways of stimulating a truly intrinsic motivation in students. From our observations and experience one thing was clear: we could not expect students to find our materials intrinsically interesting if teachers imposed a rigid structure in their classrooms. This indicated the following:

1. Teachers had to be urged to take our program apart, rather than to go through it chapter by chapter. The rigid schedules we originally proposed were neither realistic nor pedagogically sound, in that they stressed maximum coverage of externally imposed subjects rather than the intellectual growth of students.
2. Teachers had to be willing to drop many parts of the program altogether. Different teachers had to be ready to drop different parts for different students.
3. Teachers had to be urged to allow individual students to make significant decisions about what was to be studied.
4. We felt we must encourage teachers to be less concerned about maintaining artificial constraints and more concerned about their students as human beings.

In short, the ESCP staff wanted *Investigating the Earth* to be considered as a resource for an earth science course, rather than as a unique program around which to structure a whole course.

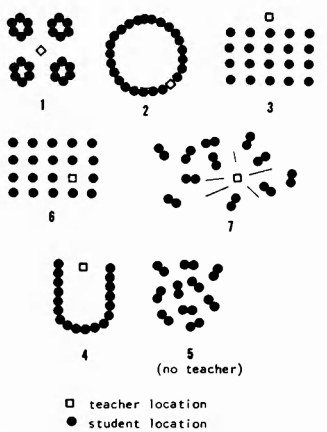
A third model of teaching-learning relationships emerged from our work. This might be called an intrinsic motivation model (fig. 3).



This model recalled many of the ideas first proposed by John Dewey. The term intrinsic is used here with reference to the student. In this model, students are allowed to decide for themselves which aspects of earth science they wish to study and they are given permission to pursue them within the constraints imposed by the learning environment the school system and teachers can provide. Fortunately, one aspect of the learning environment available at very low cost for study of earth science has almost unlimited possibilities: the natural environment outside of the schoolroom. When a teacher accepts in the classroom the freedom implicit in an intrinsic model he also has a good chance of establishing an environment of trust. This even enables him to revert to didactic and managerial styles of teaching for short periods of time in order to "cover" concepts that he feels need exposure. Students accept and profit from this kind of intrusion by their teacher when they respect him sufficiently for his willingness to listen to them most of the time.

In order to implement this third model, we felt that the ESCP program as it existed had to be considered simply as another element of the environment that teachers made available to their students. Such things as specific reading assignments, assigned questions, or having all of the students do a given investigation at the same time were out. It was still fair to choose some of the broader investigations in *Investigating the Earth* and convert them to sufficiently ambiguous assignments so that great divergence in students behaviors could be stimulated; but the teacher needed, we felt, to be very sensitive to the difference between coercion and stimulation.

Our publisher didn't much like our change in approach!



Teacher and student position diagram, from a research study by Fred Feitler. Which arrangements would you be most comfortable in? How about your students? Which would a principal or dean prefer? In which would students learn the most? In which would you be least comfortable? Which is closest to your present arrangement? What percentage of an average month do your groups spend in each of the arrangements shown?
See also p. 62, GEOMETRY.

Guided inquiry is largely based on the idea of helping students down the path to learning science. The idea is that we can save them time. One problem, however, is that by stepping in too quickly and "helping" we can actually deny learners the feeling of accomplishment that comes from doing it all the way on their own. I can think of many times when learners have said, "Don't tell me now!"

One of the aspects of teacher evaluation that amuses me is the way teachers are rated on the basis of how "helpful" they are perceived to be by an outside rater who looks in for a short while. This attitude encourages teachers to watch for the moment when a learner is just entering the critical stage of approaching a solution to a problem. Then they jump in and give him the answer just before he gets it himself.

This sets up a relationship in which the learner can become convinced that he can't complete the work on his own. He comes to believe that he is not capable of that last jump of discovery.

I hope to avoid being *helpful*. Helpfulness can be robbery if I'm not careful!

If I insist on being helpful I may have one of those dependency-based personalities. I may either want people to be helped by me, or I may want to control them by making them think I depend upon them. A wonderful article on dependencies carries the title "Chicken Soup is Poison" (written and privately circulated by Robert Resnick, 337 So. Beverly Drive, Beverly Hills, Calif. 90210).

Even though "teaching" is now thought of as one of the "helping" professions, I see the kind of "helping" I want to do as a very narrow tight-rope. I want to be me, first of all, and secondly, I want to allow others to be themselves. Holding back help that I really want to give makes me feel bad, but providing help that others don't want or that can potentially rob them of the joys of discovery, self-direction, and self-actualization also leaves me in a bad state of mind. Ultimately I count on my organic feeling about helping, and as I teeter back and forth across the tight-rope, I grow and perhaps increase my abilities as a facilitator and as a learner, too. My ability to reject help that I don't want is another side of the same coin, so that I want other people to take responsibility for rejecting help that I may offer them if they prefer *not* to be helped.

At a recent workshop I started to tell the group about some real problems I was feeling inside myself. One of the group participants had a helpful suggestion for each problem I identified. What I wanted was for people to *hear* me and to realize that I, too, as one of the workshop directors, was experiencing some of the same personal problems the participants were. I finally turned to the "helpful" person and told him, "Please, just *listen* to me. The help I want is your empathy, not your suggestions." He felt hurt, as he later admitted, but we both grew through the interaction. He grew by learning that the greatest help is often just empathic understanding. I grew by taking the risk of rejecting his suggestions. Our relationship grew by the deeper level of communication and mutual understanding and acceptance that arose from our exchange.

Roles are convenient hiding places for people. Many people tend to behave differently because of a new position they're in.

When I attended my first Department Chairman's meeting at St. Lawrence, I came tieless and in blue jeans and plopped down on the floor, one of my usual positions, rather than taking a stiff-backed chair. This created an unspoken uproar, registered at the time only by upraised eyebrows. I later learned the extent of my fellow chairmen's disapproval through the grapevine.

At faculty meetings the Dean calls on "Professor X" (Charlie at any other time), who begins "Mr. Dean... (George at any other time).

In a moment of mutual joy or good feeling I hug Cathy or Artie - but faculty members aren't supposed to do that!

Val, knowing I am a geologist, looks at my hands and is surprised to find them soft and fairly smooth rather than horny and calloused. This leads us to talk about us as we are instead of us as we are "supposed to be."

Now that I'm a "professor," certain people treat me differently than they did before. And yet I'm the same me.

William signed up for a set of "discovery packages" being offered through his school. We all decided they were worthless and cancelled the subscription. The company began to harrass us about payment for materials we had already returned. I wrote to them on plain paper and signed just my name ("a parent"). The harassment continued. I became annoyed at the insulting tone and finally wrote on curriculum project letterhead and signed my title as "project director" below my name. A long and careful apology came back from the company president. How is it that I, Mr. Parent, got lesser treatment than I, "Project Director"?

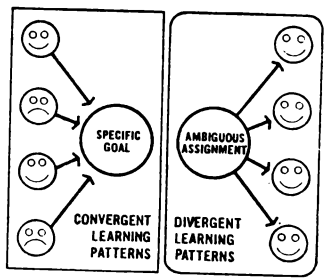
As far as these roles are concerned, I can let myself go along jumping from role to role if I choose to do so, riding on reputation or else desperately trying to get one - always aiming for a more prestigious identity. One former colleague of mine who is now a high university administrator once advised a graduate student, "Never accept a new position unless it's a step up." I'm not sure how I define "up" anymore. A geology chairman I knew once told a junior faculty member not to go out drinking beer with the graduate students. As he put it, "There are the officers and the enlisted men, and you're now an officer."

I can also choose to reject these role distinctions. In my own experience, I feel that they inhibit confluent learning. If I am a *teacher* and you are a *student*, that inhibits our relationship. If I am I and you are you, then we may have a chance for the kind of relationship I seek. If I am Department Chairman and you are a department member, that can cause problems if those roles lead us to act differently than we both would with "equal" titles. If I am a project director and you are a secretary and this has an effect on the way we behave toward each other, then we hinder effective functioning. In a confluent learning situation we seek greater awareness of these problems in order to transcend them.

CONVERGENCE VERSUS DIVERGENCE IN THE LEARNING ENVIRONMENT: THE ROLE OF AMBIGUITY

In general, the emphasis in schools is upon getting learners all to *converge* upon a single idea or point. The result is that some learners will fail to find interest in whatever a teacher could possibly suggest. The possibility of finding a single topic that 25 or 30 people are interested in at the same time is diminishingly small. A different approach involves a *divergent* model of education in which learners are invited to do many different kinds of things, with each learner being allowed significant alternative opportunities for action.

In general, teachers seem most concerned with helping familiarize learners with things that are strange to them: making the strange familiar. Another approach, which has to do with the growth of awareness and creative powers, is taking supposedly familiar things and allowing people to find how strange they really still are, how much novelty we can still find in things we thought we were well acquainted with. In my view a divergent approach, one based on relatively ambiguous suggestions by the teacher, and one that frequently deals with looking more closely at so-called "ordinary" things, can have a highly stimulating and beneficial effect in the development of intrinsic motivation among learners.



THE TEACHER AS A CHANGE-AGENT: A ROLE IN VALUE CLARIFICATION

In *Beyond Bureaucracy,* Warren Bennis explores the concept of change-agents in institutions. For the most part, his analysis deals with careful planning of changes in organizational management in the direction of greater valuing of the individual human being in institutions. Humanization leads to better institutions and eventually to a higher quality product. Bennis develops a tentative classification of change-agents. The *external change-agent* comes in from outside, usually as a consultant, to help the members of an organization develop plans for change. I know this role well from my activities in the Earth Science Teacher Preparation Project (ESTPP) where we spent three years consulting with people from the science education groups of over fifty universities and conducted dozens of workshops devoted to planning for change. I felt great frustration as a full-time external change-agent because we were never "on the line" as far as the results were concerned. In the long run, our function turned out to be that of trying to develop other change-agents - not just to bring about change. I still value and exercise this role occasionally and find that it does stimulate some activity and also gives me ideas.

Bennis also identifies the *internal change-agent.* This person works full-time within his organization, and may hold either a line position of direct responsibility or a staff (advisory) position. Bennis suggests that extensive change within an institution may require the support of a high-level, *line* change-agent as a top manager. Pirsig, on the other hand, suggests that effective change has to originate *within* individuals and that institutions as such really change only as individuals within it do.

For several years now I have found myself in one of those internal, line, change-agent positions as a department chairman. The "power" of the position has unquestionably helped in getting some things done. At the same time, it may also hinder to some degree: it has made it possible for our group to move faster than the institution as a whole may be able to tolerate. Still, we have at last begun to develop and test a model more extensive than any of us as individuals could sustain. I want to see more people acknowledge their roles as agents in their own right. Every effective teacher is a change-agent. We cannot help dealing with values. Even if we tried to deliver value-free education to learners, this would not be possible. To pretend so is self-deception. Each of us portrays a set of values in his or her very existence. We serve as models whether we choose to or not. Since this is so, it becomes essential that we consider our values carefully, that we be aware of what they are, and then decide if we are satisfied with them ourselves. If we are not, then we had better let these values change in ourselves, too. It doesn't work to try to "teach" values that we don't really hold, either. Students immediately see through the do-as-I-say-not-as-I-do posture.

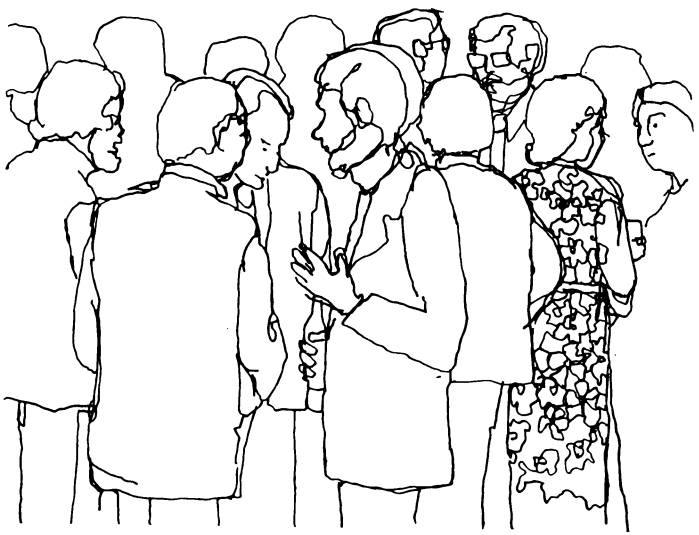
I take responsibility for my own values and I will certainly express them. Not as "you shoulds...," however, but as "I believes...." To quote from Bennis,

> *(Change-agents) seem to receive their impetus as much from the urge to improve society as from simple curiosity about its working. They seem to be as intimately involved in affecting change as they are in studying it. They have developed a self-consciousness about the strategies of social change as well as about its goals. They are driven by a radical rather than a conservative ethic, which means simply that their attitude toward social change springs from locating the ills of society in its institutions, where something can be done about them, rather than in human nature, where very little can be done about them. In short, the change-agents are not only* interpreting *the world in different ways; some intend to* change *it.*

As soon as we enter the arena of education in values, however, we are in a political hornet's nest. *Phi Delta Kappan* devoted an entire issue to articles about aspects of values education. Sid Simon, Howard Kirschenbaum, and others have written about *values clarification* in education: ways of helping students become aware of their real values and learn to take personal responsibility for them... or to *change* if they are dissatisfied with their values. This also applies to scientific and societal values which people see expressed in our culture. How about energy? How about the environment? How about war? How about schools? How about "big science?" How about technology? How about growth? The American Association for the Advancement of Science has begun to recognize the responsibility scientists have to identify and express their values. Scientists have long been criticized for their failure to recognize that their activity affects society and their frequent attempt to deny responsibility for how their discoveries may be used. True, they cannot control how other people use their ideas, but they can express their moral and value positions with respect to them. *Science* magazine has recently been full of "science and society" commentary, analysis, and dialog. The *Bulletin of the Atomic Physicists* was one of the early journals in which scientists began to acknowledge their responsibility. Einstein's biographies express the torment he experienced over value-related issues.

I do not suggest, nor do Simon and others, that we should try to "indoctrinate" others with our values. Rather, each person at each level needs to know that he or she is responsible for values held and that anyone who is dissatisfied with his or her own values can work to change them. Ultimately, society is bound to be affected. This is threatening to people who would like to impose their values on others, and there are many such people.

When people in institutions of higher learning accept that every teacher is a potential change-agent, whether he or she wants to be or not, the potential for a chain reaction is set up. If college students and pre-service teachers become aware of their power, each of them will go out as an internal change-agent into whatever institution he or she may join. Those who go into teaching have the potential to open their students up to regular clarification of value-related issues that form part of any cognitive learning. This leads, of course, to confluent education. Students interact with their peers, with parents, and with other teachers. Gradually, more and more people become aware that all of us, whether we choose to be or not, are actually change-agents anyway. This can lead to dramatic evolution of our institutions in a direction of greater humaneness. I feel it necessary at this point to restate an assumption included in this whole discussion. This is that the human being is basically "good" and sensitive to a notion of "common 'good.'" For those who begin with the assumption that man is unpredictable, unstable, passive, inert, and needs to have tasks assigned to him (assumptions made by the "scientific" managers and bureaucrats such as Max Weber, Frederick Taylor (inventor of the assembly line), Henry Ford ("All we ask of the men is that they do the work which is set before them"), and by behaviorists such as B. F. Skinner who suggest the need for benevolent "controllers" the model sketched above will obviously be unacceptable because of the initial discrepancy in value-positions. And yet, even here, with good will, we may be able to identify some common ground and begin to transcend the apparent dualism that seems involved.



SCHOOL BUILDINGS AND CLASSROOMS

School buildings are rigid places for establishing a confluent environment. You have to go to them until at least age sixteen, and a lot of people carry on through at least grade sixteen. Not so much because they really want to, but because our ethic says, "You *ought* to." You really aren't *there* until you have a college degree. It's better to be a college-educated white-collar worker than an "uneducated" blue-collar worker. You are defined by what you do, rather than by what you are.

The building itself, especially in the elementary and junior high school years, takes on a character not unlike that of a penal institution. In many city schools the doors are locked, and both entry and exit are carefully controlled. The buildings are supposed to be community property, but community members rarely feel welcome in them. Those are the buildings the children are kept in during the daytime. In some high schools, students may leave the building when they have no scheduled activities inside it. Generally people come and go more or less as they choose in college buildings. But even there the patterns of traffic flow indicate something far less than "free" movement. Halls are generally full for precisely ten minutes out of each hour. Classrooms are full for precisely fifty minutes of each hour (or whatever the period lengths and passing times happen to be). A somewhat more informal flow of people occurs around administrative offices, teachers' spaces, and rest rooms, (Although in public schools even rest room traffic may be regulated and controlled by "passes.")

In a metaphorical sense the school may be even more a box that confines people than it is in the physical sense. We condition people to think that school time is the time for learning. School work (reading for a class) is sharply differentiated in the minds of most students from exactly the same kind of activity (reading) for pleasure. My room at home becomes an extension of the school building when I am doing school work.

The usual activity of the school building becomes stereotyped in many schools, too. Even when teachers "break free" and go outside of the actual school walls for awhile they may use "in-school" formats. I recall a class in one of Cricket's junior high schools which went outside to hold its session because the day was so nice. The teacher took a lectern out with him and stood there out in the middle of the lawn, lectern before him, with students seated in rows, on the grass, taking notes as he lectured.

Or I think about a junior high-school field trip where the students were all seated around the teacher having a vocabulary drill - right out in the middle of the Colorado Rockies. A fantastic environment surrounded them, but the teacher tried to limit the awareness and attention of the group to his questions, turning them *away* from their immediate surroundings. As a facilitator, what I now want to do is legitimize awareness of here and now surroundings and feelings. This teacher had transported the rigid classroom clear out into the Rockies.

In our ES materials, many of the "assignments" start with the phrase, "go outside and...." Our attempt has been to break out of the physically and metaphorically limiting aspects of school. This has so far been one of the most difficult things for schools to cope with in using our ideas. We say, "Do inside the school buildings the things that those spaces are uniquely suited for. Do outside the school the things that can better be done there. And above all let movement be free among the many out-of-school environments and the in-school environment." School buildings and classrooms as places to hold people in for fixed times, regardless of their activities, can only inhibit and compartmentalize learning. I want to redefine the concept of "school" to include the whole world.

I am amused by the ways in which my university deals with "keeping people on campus." This is a stated goal. The assumption somehow is that more learning can occur there than in the larger environment, I guess. We are working to introduce more off-campus internships, field semesters, and other such activities so that students may receive "credit" for working in the fertile learning environment beyond the metaphorical wall that surrounds our campus. Our students have trouble getting permission to live off-campus because we define ourselves as a "residential college." We build thick, impenetrable walls to protect our people from some reality or the other outside of our community. This ethic operates as if the only way to build community is to confine people closely behind institutional walls. The enforcer here becomes not bricks and mortar but the granting or denial of credit for various activities. I say, on the contrary, that the only *real* community is the one with perpetually open doors, both physically and metaphorically.

These we *can* get around, I find. We have legitimized a large number of informal off-campus experiences that occurred, technically, while the person in question was "on leave." It seems foolish to me, however, to have to bootleg "credit" for learning experiences that both the learners I am working with and some of my faculty colleagues perceive to be worthwhile and worth credit.

"Bootlegging" (or using the loopholes) is one effective way of breaking down walls. I am prepared to and will use this way as long as I perceive phony and inhibitory walls that other people erect to limit my learning activities and those of people I work with.

Curriculum is used as a means of limiting inquiry. It has always somehow or the other and at least in part been handed down from above. I can always use it as a way of avoiding taking responsibility for what I do as a teacher or facilitator. I go ahead and impose something on a group of people. When they complain for any reason or if I do a "bad job" of it somehow, I can always say, "But it's part of the syllabus." This cop-out is used at all levels from kindergarten through graduate school - the substitution of an outside-prescribed set of stuff for my own good judgment.

After a dozen years of being a curriculum maker for elementary, secondary, and college levels and on local, state, and national levels, I know that the curriculum makers are just as confused and uncertain as everyone else is about what *should* be learned, in what *order*, *how* it should be presented, and similar questions. Nevertheless, as soon as one of these curricula gets distributed teachers start to use them as if they had come from heaven. They follow the new rules sent down from up there. They leave out things they really want to do, and they fail to respond to their students because they "have to cover the curriculum."

In science, the last fifteen years have been an era of new curricula from all levels. The movement has been led by the National Science Foundation. The curricula produced through NSF may be more restrictive even than some of the old ones were because they actually specify not only the subject matter to be covered, but they even dictate the style the teacher should use. These new curricula are said to be more "up-to-date" and this time have been prepared by "real" scientists, but in fact the teacher is also told in more detail than ever how he or she should behave.

The NSF hang-up on "real" scientists has come across to me in a fascinating way. When I left my job as director of the Earth Science Educational Program, I recommended that a couple of our senior staff people take over as directors of our two earlier projects still in business. John and Bob (non-Ph.D.'s) had had many years experience as curriculum people and also had long and deep backgrounds in science, though they didn't happen to have been into "basic scientific research" as such. The NSF staff rejected them as titular directors on the grounds that they were not "real" scientists. They even went so far as to say "We're not questioning the abilities of the men," but, by George he'd better have a Ph.D. in a *hard* science to be called "director." They finally allowed us to hire a "bona-fide" scientist as a part-time "figurehead director," with the primary directors' duties actually fulfilled by the people we originally intended. This notion of "real scientists" limits creativity and the value of the final products of the curriculum groups.

Curricula in general box people in (if people will let them do so) and the new NSF-produced curricula make potentially tighter boxes than ever before. I am ultimately the legitimizer for what goes on in my classroom - even in the most traditional of schools. My relationship with the learners in the room is probably the most important single factor in whether or not I will help or hinder learning. I can bend and redefine the notion of curriculum in as many ways that I need not let it limit me, for all intents and purposes, at all.

During spring, 1966 $\langle J_{CS} \rangle_2 = 0.67^{137}$ Cs atoms/cm^2 sec. and $\langle JT \rangle = 51$ HTO molecules/cm^2 sec.

Ce qui importe, c'est de toujours preservuer la langue francaise.

... geomagnetically trapped alpha particles over the energy range $1.18 < E < 8$ Mev obtained with the Injun 5 polar-orbiting satellite.

Vi snakker syv sprog og sechs av de er Norsk. Heute ist Deutschlands Eingefluss grösser als niemals.

Language, said by some to be the capstone of humanness, turns out to cause many difficulties, also. I am especially aware of this when I travel abroad. For me it becomes a challenge to try to understand and communicate through language, wherever I happen to be. And yet, in spite of my interest and the work I pour into it, I feel frustrated a great deal. I think of myself as beginning to develop some kind of decent capability in Norwegian. Yet when we moved up to Straumgjerde for a few weeks I found I could understand almost nothing of what people said to me. They can understand my Oslo dialect (Dano-Norwegian or bokmal) fine, but the local dialect here, based on Norway's second official language, Nynorsk, and even different from that, is difficult for me. When we were up in the Norwegian arctic several years ago, there was yet another dialect to deal with.

I think of myself as being able to communicate fairly well in several other languages, too, but when it comes down to expressing really fine distinctions in my feelings and ideas I feel frustrated. The problem extends to English, too, where I think of myself as being facile with words. Even in my native language I speak or write in such ways that I often do not communicate the meaning I wish to convey.

Language allows me to communicate only an approximation of what I mean - never fully what is in me. I have other languages, too, that can convey much. My body has a language. So does my face. I communicate a great deal nonverbally. Some psychologists and linguists suggest that perhaps half, three quarters, or even more of our real communication occurs as non-verbal cues of various kinds. I am especially struck by this in the art of pantomine which to me often conveys far more than plays with words. I still recall vividly two evenings and about five hours of sitting through Jean Louis Barrault's fine classic film *Les Enfants du Paradis* about a mime group. This was twenty-five years ago. Likewise I have a vivid mental image of mime presentations - no, communications is a better word - by Marcel Marceau and by other mimes. Often non-verbal language tells me exactly the opposite of what a person may be saying to me verbally. I am inclined to believe the non-verbal cues. More and more, when I observe this conflict I want at least to ask the person if I am reading the cues correctly, so that we can refine our communication. More and more I find myself wanting to try to communicate with others in purely non-verbal ways and to understand their non-verbal language more clearly. When I was teaching an elementary geology course at Syracuse I went to school one morning with a bad case of laryngitus. As I walked up to Lyman Hall I decided that I would simply write on the board, "I have lost my voice today. You do the talking. I will be glad to respond by nods and in other non-verbal ways." Unfortunately, I lost my nerve as I walked in and saw eighty or ninety people sitting there, notebooks open and pencils poised, waiting for me to present them with truth and knowledge. I went ahead and lectured in a very croakey voice. I think that now I would be able to go through with a "silent lecture."

The study of language is, of course, a science even in the hard scientists' definition when you get into the box called linguistics. Other sciences can be looked at as languages or sets of languages, too. Mathematics and logic are certainly symbolic languages. In art, attempts are made to express feeling and ideas through purely pictorial and geometric representations. When I look at the way most science is taught, I think that most science courses are really language courses just as much as Latin is. The new words are usually printed in bold type in most introductory science books. Science tests always include a substantial component of words to be defined. What would science be without its vocabulary? Even scientists in different areas of interest don't understand each others' language. Sometimes, in supposed attempts at more precise communication, even relatively simple ideas that might well be expressed in everyday language become couched in technical language.

As I write this book I realize that I am throwing in all sorts of jargon without even meaning to, so much is some of my jargon a part of me that I am not even aware of. I become conscious and aware of it largely when I interact directly with people who ask me what I mean by what I have just said. That was one of the biggest problems I felt in my earlier days of regular lecture courses. People sat and listened courteously and I assumed they understood my language. Only later, if ever, did I find out the extent to which I was "over their heads." That last phrase, to me, indicates linguistic difficulties more than anything else.

Once I made some talks at New Mexico Highlands University. In one of these, a very informal dialogue with perhaps twenty people, I thought I was being completely non-technical as I described some environmental studies materials. When I had been talking for a few minutes, one person in the group, responding to my invitation to make our session into a dialogue, spoke up and said he failed to under-

stand what I meant by about half of the words I was using. So we explored this idea, and the session became much more a dialogue in which we regarded as first approximations all that I put forth.

David Leveson, in *A Sense of the Earth*, acknowledges the same problem I have presented here. Perhaps the language of geology isn't all that important. Leveson doesn't want the development of people's sense of the earth to be hindered by words. Much of what people mean when they say that science is *hard*, I think, is that the words used in science are different and strange. Concepts may be simple and easy in the long run, but language may actually obscure rather than clarify them. Yet Leveson tells how the words of geology provide him with short cuts and symbolic ways of representing his own understandings to himself. Thus he recognizes the dilemma of his need as an interested and aware professional for adequate ways of communicating with himself and other aware professionals. He even likes the words of his science. I agree with him that this language is often nice to pass over the tongue and through the mind just for the sake of the words themselves, each of which has its own special history and set of associations. But he doesn't want people who are not interested in the language of the science to be hindered in their non-verbal or non-technical appreciation and awareness of the earth.

On a field trip in central Wyoming two years ago, I accompanied a group from Syracuse University on a one-day visit to a group of rocks with which I happen to have worked a good deal. As we discussed these, using the terminology available, much of which was unfamiliar to the group of faculty and graduate students on the trip, John Prucha said, "You fellows really ought to develop a more precise and complete terminology for the rock textures and types here. They are unique, and our words are not adequate to differentiate them from other types." A counter view was expressed by Hugh Taylor when a group of seventeen of us, all more or less specialists in working with these particular rock types, were together for part of a summer in northern Labrador. We were using all kinds of jargony short cuts and technical language related to this group of rocks and making up new ones of our own. Hugh finally became furious about the proliferation of jargon and for several days continued a highly articulate, passionate, and sometimes profane plea for the use of simple language.

I am aware of special geographic terminology where I have worked in Norway. The life of many people centers along the seacoast, and a whole set of special names for coastal features has developed over the years. There may be many words to express the idea of the same feature with different shades of meaning. At the end of one peninsula in the Oslofjord for example is a place called Nesoddtangen. Nes, odd, and tang are all words for "point." Nesodden is the name of the larger peninsula as a whole. Nesoddtangen is the point on the end of the peninsula. Altogether, the best English translation we can come up with is The Point-Point Point. The same is true of Norwegian farm terminology. A whole set of special words were developed so that one word was enough to tell you exactly which part of the farm was being referred to. This made life simpler for the Norwegian farmers of the 19th century, but it makes the understanding of novels from that period more difficult for us today.

What it all means is that if I really want to understand and absorb ideas and express meanings and be aware of other people's meanings I cannot ever trust words and language completely. They become strictly an approximation - a title as it were - a peek into someone else's experience or a peek that I let someone have into my experience. If I recognize the limits of language I can transcend self-imposed constraints and search for the meanings underlying words.

When I do this, for one thing, I begin more and more to avoid arguments over words and their meanings. If my interest is in communication I will not worry so much about fixing word meanings. I will always be looking deeper in any discussion. When I think about how much energy is expended on vehement arguments over terminology at scientific meetings I begin to chuckle. When I think of the people who have failed (or passed, for that matter) science examinations on the basis of word meanings, approximations as they all *must* be, I am sad for people who feel they *don't know* or *hate science* just because of a few trivial word problems. At the end of last term, as I was straightening up a lab, I found two discarded term papers that had been written by a person whom I consider to be one of our most promising young scientists. On the next page is what one of his instructors wrote across the front of the paper. To me, comments like these treat language as a tight formalistic business where meaning is subordinated to form.

I want to spend my energies increasing awareness, understanding, and strength. One way to do this is by understanding the possible roles of language and then choosing, consciously, attitudes and approaches that are consonant with this hope. In confluent education we must become more accepting of the roles other people choose to give to language in their lives. They can choose to be controlled by it or they can choose to use it in their own ways to further their lives, goals, and understandings.

This equals an F on grammar. The last half of the paper, forgetting about the sp.; agr. of antecedent errors (which I can't really do), might have merited a B. So that's how I got the final grade.

Before I accept and grade this paper I would like you to take a Handbook of grammar and Composition (I'll lend you one at the exam) and study it so you can explain to me:

1. comma splices and the use of semicolons (p. 3)
2. agr. of subject and verb (pp 2+5)
3. agr. of pronouns and antecedent (pp 8+9)
4. The use of quotes w indented, single-spaced passages.

I also want a list of all the words misspelled in this paper spelled correctly (at least 13 of them).

The Literary Treatment

of

Three Guides of the Adirondacks

Jerry Pond
November 7, 1971
Dr. MacIntosh
Literature 123

All your words for literary forms are wrong at times: novel, essay, short story, sketch, story, article — all used loosely

The paper really picks up on p. 5, but the first four pages are almost enough to sink it.

Actually I think you got into good subject matter here, wide-ranging and unfrequented, and used some interesting measures of analysis in distinguishing the guides and their patrons, who became in fact their disciples in the woods

C —

I believe that the most important kind of learning - perhaps the only real learning - is experiential - the kind in which I am involved in some kind of experience. This statement requires expansion if it is to make sense. Experience can be of a direct nature in which I actually place my hands on something and manipulate it. Likewise it can be of a vicarious nature. By this, I mean that I can learn through someone else's experience, too, providing that I am involved personally to the extent that his or her experience enters deeply into me, and I adopt it and in-corporate it (take it *into my body* as if it were my own).

As important as what physical things are going on around me is the way I relate to these things. You can put me in what you think is an "experiential" situation and I may learn little from it. My experience is *within me* and nothing anyone does outside of me can actually cause me to experience some set, planned thing, nor can they ever know what I really experience.

> *Right now, as I begin to write this major section on physical environments I am aware that I am experiencing apprehension. I am also experiencing sitting on a terrace in the University of Oslo student dormitories used as a summer hotel. I experience the warm sun that just worked its way around a tree beside my table. I am experiencing the visual impact of a pretty girl walking across the lawn. I am finally beginning to experience the flow of my writing.*

I can put a learner in a physical place fitted with all sorts of things. But in so doing I cannot predict or control what he will experience. I can direct him to do some specific things, and his hands may go through motions that I expect to see them perform. Yet he may actually be experiencing a very different set of things than what I had "planned for him." His actual involvement may be his awareness of "It's hot in here." His real experience may be an elaborate fantasy related to a girl friend, an athletic event, a walk in the woods. Thus, apparently vigorous physical activity does not necessarily mean that the physical actions are the real primary experience of the person.

Likewise, the most passive-appearing person may be experiencing a whole range of direct physical aspects of his or her environment. Some awareness-development exercises involve merely sitting still and trying to perceive as many details of the immediate environment as fully as possible. I can restrict the number of my senses that are functioning in trying to carry this further. I can close my eyes, hold my ears, or hold my nose as I try to eliminate the effects of some of my senses. I can focus my experiencing or I can let it flow. I can have what is to me a direct-seeming kind of experience when I read, as the stimuli of another person's communications come into play with the results of my past experiences and my present and immediate feelings.

If I accept that the loci of experience and learning are within each individual person, this alters my attitude toward the physical environment provided in places called schools. I accept that I cannot really force experience of any kind. (Perhaps I could resort to highly sophisticated brainwashing techniques, but many people have proved resistant even to these!) The easiest and most effective way to help learning occur in the long run is to use whatever powers I have to legitimize the experiences that people are actually having and to invite people to give themselves more fully to these experiences. This means that I want to remove the "shoulds" from the environment. The physical aspects of environments I shall discuss have to be present only as access and follow-up routes rather than as prescribed directions. The question I want to ask is not "What *should* the learner be experiencing now?" but rather "What *is* this learner experiencing now and how can it be capitalized upon in terms of the learner's awareness and growth?"

No things *I* do in the learning environment or add to it physically are necessarily going to improve the quality of the experience a given learner will have. All I can do is increase the probability of his having a better and fuller experience by helping him or her to be more fully aware. Experiential learning increases as personal awareness increases.

When I start building a better physical environment for learning, it is only natural for me to expect to see some results in the form of better learning going on. Therein lies a dangerous trap. Any single thing I create, and add to the learning environment, no matter how great it may seem to me or how important the concepts in it may seem to me, may not be picked up immediately and used by learners. It may not be used till next year or it may never be used. All I can do is operate on the basis of probabilities.

A favorite line of teachers is "I tried that and it didn't work." What they mean is that they gave it *a* try (or two or three, perhaps). They didn't have sufficient optimism and a sufficient sense of probability to keep this element in the environment as something for learners to come back to later. Equally perilous is the tendency to expect that "if it worked once, it'll work again." This is another sure route to disappointment.

One must try to build an environment that gets cumulatively richer and better as everyone who uses it adds to it. Each new possibility for experiencing that is added increases the overall probability of having the next learner find a basis for experiences in which he will become intrinsically involved.

Since it is potentially impossible for me ever to create as rich a learning environment

as possible I also want to extend my concept of "the learning center" to the whole world outside the school. The school becomes not only a place to be *in* but a place to *go out from* and hopefully to return to.

I am learning, painfully, that the learning environment within the school grows very slowly if I try to expand it all by myself. If, on the other hand, a sense of community can be generated within the total group of learners ("teachers" and "students"), then contributions to the environment increase in proportion to the number of contributors. If each learner contributed one new piece of "stuff" (in the sense of a new route to insights for learning) to the more or less permanent resource bank of the school learning environment, then the number of additions may be extended one-hundred-fold and more in each unit of time.

I know that I can never be satisfied with a learning environment. As the environment I create grows, it just makes me see more possibilities. There are two ways I can look at these. One is to say, "I'll never succeed at what I really want to see there." In this case I end up in a state of despair, the victim of my own preoccupation with future-think and what isn't there. I waste energy to the extent that I despair in this manner. On the other hand, I can choose to feel good about what is there already and devote my energy to the use of what I already have there and to the creation of new possibilities. Rather than saying, "We can't do that now because we don't have (*fill in anything*), I can choose to say, "Go ahead and try to find a way to create the possibility you want."

If *I* try to take responsibility for getting everything everyone else needs to have the experience he desires, I'm finished.

When Lucretia and I did a course entitled "Art and the Earth" we told the participants that each person would have to take full responsibility for obtaining his or her own materials. Yet people tried to depend on us, expecting us to get a wrench for them or a paint brush. Often they asked us to do their work for them. In the science department I work in many learners start out on new project work and express a desire to find everything all laid out for them. Often, educators spend much of their time acquiring things for other learners, depriving themselves of time for personal creative activity that may be far more important to the quality of the learning environment. I know now that *acquisition* of materials is as important an aspect of learning experiences as is the use of the materials in the creative enterprise. The learner who requires a golden laboratory with all things laid out before him is not in touch with the real world of creative activity. There is a risk here, for me as a facilitator, on the side of thinking, "Well then, I don't need to provide any materials. The learners will be deprived if I provide anything more than a bare room." A balance is obviously necessary between my attempts to provide a rich environment and my desire to give learners a chance to cope with problems of obtaining of materials and of doing for themselves.

What is important is to keep working at expanding the materials, equipment, and resources available at any time, but then to pass on to *all* members of the community responsibility for continuing the building process. "If we don't have it and you need it, *you* go get it." Each user of the environment becomes a contributor as well as a consumer.

We allow our order-books for local stores to be taken out by any person to get whatever he needs and to charge it to our department. Even for larger items of equipment, a beginning person has as much right to put in an order as does the most "senior" faculty member. We have had no real problems of over-expenditure. When budgeting limits start to close in on us we sit down together and talk over our needs. At such times, we discuss items costing more than a few dollars, and our priorities, within the *real* budgeting limits we face, are established by the group.

If we encourage each individual person to seek his own resources, all things may ultimately be possible. Potentially, we unleash the possibility of chain-reaction-type growth and extension of the learning environment.

At an in-service training institute for elementary and junior high school science teachers being run at the Educational Development Center in Newton, Mass., George Hein and John Merrill had one of the richest learning environments I had ever seen. The participants should have been exhausted from the full day of teaching in which each had been involved before the session. George complained about how many things were lacking in that environment. "If only we had a ..., then we could...." George and John maintain *creative dissatisfaction* with the environment they work in. The environment, as a result, continues to grow and improve. At the same time, they are at peace with what they have already created and allow it to provide a basis for many new beginnings.

The physical environment I want to foster for learning science is an *environment of invention*. Another term that has been applied is an environment of *convivial access*.

In pursuing aspects of the physical environment, let us assume a set of spaces within the school plant or learning center. These spaces can take the form of ordinary schoolrooms. Or they can be the newest and fanciest kinds of open-space quarters at the other extreme. They can include sophisticated, expensive laboratory benches with gas, compressed air, vacuum systems, etc., or they can have no special equipment. The quality of science learning that goes on in the learning center has little relationship to the elaborateness or simplicity of the physical setting. In this I take exception to the elaborate study Joseph Novak has led for The National Science Teachers Association (*Facilities for Secondary School Science Teaching*, NSTA, 1972). I, too,

would prefer to have fine physical plant and resources available, but a lack of these need not hinder the acquisition of important science learnings and skills. Likewise the presence of fine facilities is no guarantee of a good environment for learning science. Fine facilities often camouflage poor quality of science programs. Fancy labs impress parents and other taxpayers on casual visits, but elaborately "scientific" spaces and equipment provide little indication of the quality of learning that goes on within them.

It may be that the presence of a science "center" is restrictive and discipline-oriented. Perhaps it will be better ultimately to scramble up science, art, music, and literature. In most well-functioning open schools today, some division into learning areas where certain kinds of materials are more or less concentrated is made. Retrieval and access problems can be frustrating and can hinder creative involvement if some kinds of things that seem to "go together" are not stored near to each other. Thus I shall focus here on the nature of an area *mainly* dedicated to science, broadly defined. The contents of the science center need to be looked at as highly mobile, and the presence of science materials in the music or literature areas and vice versa will be of great value. At the Wilson Campus School in Mankato, Minnesota, Don Glines suggested the notion that there ought to be plants and animals in every room. Thus, materials from science, language, arts, music and fine arts might be included in each of several learning centers individually devoted mainly to science, language, arts, music, fine arts, etc. Such materials would serve as invitations to move beyond the walls of any one center at any time.

ENVIRONMENTAL ELEMENTS TO ENCOURAGE EXPLORATION

If intrinsic motivation and personally chosen experiences are necessary for learning, then certain areas of the learning center must encourage a very open kind of exploration.

How can interest be stimulated? I am setting aside value questions about whether or not I "should" try to stimulate interest in science. I feel that approaches and things included under the name "science" have been and will continue to be useful. Most importantly *I* like them, so my energy flows naturally in this direction and it may attract exploration. Energy attracts energy. Any activity or materials provide a basis for stimulation. If I sit down at a table with *things* on it, I am likely to pick them up and manipulate them. If my interest is aroused I may play with them in a more purposeful way.

So I need *things* in a science center. I want to get away from the idea of all of the rocks in one room, all of the chemical things in another, all of the physics experimental materials in a third, and all of the specimens of living things in yet another. I want to create a basic exploration area which people can use to generate their own questions.

A lot of my own experimentation with environments for exploration has been in the area of the earth sciences. Fortunately this is a broad area, so perhaps some examples, in the form of a list, might be useful:

Stream table (4' x 12' x 1') full of sand, with water led in by hoses
Lapidary "shop" for cutting and polishing rock samples
Trays of labeled rock samples and minerals
Trays of crystal models
Drawers of rock and mineral unknowns
Rock and mineral thin sections
Several dozen drawers, each containing the material for a programmed lab experience that can serve for short-term play or for hours of more concentrated activity
Geology and other science games and puzzles suitable for people to sit and play
A pottery wheel with clay available. Access to kilns as necessary
Simple and more complex microscopes
An audio-visual tutorial listening and study area
A glass-blowing set-up
Sets of fossils
A large map case with topographic and geological maps available
Access to shop equipment for building simple apparatus, models, etc.
Materials in the form of wood, hardware, paint, test tubes, graduated cylinders, miscellaneous laboratory glassware, etc.
General project spaces
Miscellaneous "kits" of science materials available from commercial supply houses
A browsing library in the main exploration center
A comfortable conversation area - carpeted, with floor cushions. It should invite people to "be around" casually
A fume hood, gas outlets, etc. for chemical explorations

"Changing interest" set-ups. Placed on benches around the center are materials in the form of problems and displays that are changed regularly. These provide a set of foci that are "on special" for the week. Thus an uncommitted person can browse through a new set of material each week without having to make big decisions or without even having to make so much effort as to open drawers. We have tried setting up some of the following:

Rock of the week
Mineral of the week
Lab exercise of the week
Air photo of the week
Puzzle of the week
Game of the week
Fossil of the week
Map of the week
Experiment of the week
Science Journal articles of the week

These and others enable us to "feature" certain aspects of our collections.

To augment the materials in this exploration center and cross more disciplinary lines we need pickled animals in bottles, materials available for dissection, live animals, a collection of science fiction books, meteorology equipment, astronomy equipment, slides of prepared biological materials, and physics and chemistry experiments of many kinds.

We are trying to have the exploration center manned on a regular basis by either a faculty person or an advanced student who is interested in helping others (and firming up certain aspects of his own knowledge through "teaching"). When no one comes in to work with the people who are "on duty" we ask them to work on the creation of new programmed options. Even when there are learners in the center engaged in exploration, I do not generally seek to insert myself into their explorations or to try to be "helpful." Attempts to be "helpful" often side-track people who begin to follow a track just because they think they "should" to please the lab attendant. ("That's what he wants me to do, so I'd better do it.") We spend much time trying to put together new programmed "units." As yet we don't have much of a fix on the extent to which such "units" are used, but hope to watch this in the future. Sometimes people in the center who have dropped in just to talk end up helping to assemble a new program. They may end up going through an activity and having a worthwhile, intrinsically motivated experience.

Some people come into the learning lab, like John did one day, and say, "O.K. chief, lay it on me. I want you to tell me what to do today." I generally point to the "suggestions for the week" and offer to discuss any part of that whenever the person is ready.

Otherwise he can help me with whatever new things I am working with. Or we can sit and talk if that's what seems important at that moment.

The learning center is kept open at all times when the building is open and is thus unmanned for much of the time. We finally took the door off so the room couldn't get accidentally locked up.

We are inviting people to "take a break" from their other "work" by browsing in this learning center the same way they would on a "playground" or in a bookstore. We commonly find learners using the sand table (stream table) for what appears to be miscellaneous play - sand castles, watching the water erode an area on the table, building things. Some of our more creative geology majors have started with such random play, gotten interested, started asking questions, and suddenly found themselves involved in sophisticated play.

I am especially interested in taking advantage of all that educational technology can offer us. Some of the programmed learning techniques pioneered by Skinner and his associates are of great value. A fundamental difference in our use of such material in a free learning environment is that the learner is never put under pressure to use any of them. I do not want even "subtlely" to induce him to go through any of the programmed materials with implications that he really "should" even though I'm not requiring it. I want him to go in from a purely intrinsic basis, with his eyes wide open. If he feels "tricked into it" later on then he will not be taking full responsibility for his own learning. Thus, in my relationship with the learner, I want him to know at all stages that *he* takes responsibility for his own enjoyment or disappointment. I make no promises of interest. No "Try it... you'll like it." Only, "Here's a possibility; try it if you decide to; take responsibility for your own attitude toward it."

The programmed materials we are presently working on take several forms. Among these are simple paper and pencil programs. Others are much more elaborate and involve color slides or motion picture film loops, tape recordings, materials, and study guides. We are acquiring all of the commercially produced programs we can afford to buy. Some of these are excellent and will be used a great deal. Others are not especially good. But even the grimmest ones may prove useful to a learner with a special interest or who is especially tuned to an approach which may be what he wants. Such programmed materials take up little space and provide new options at little cost in energy. As long as we don't require learners to use them, it doesn't matter how "educationally sound" or "unsound" they are. If they work for some learners they're worth having, within the limits of our capabilities. In this sense programmed materials serve as an aspect of a library. Each new program on the shelf of the learning center is like another kind of book on the library shelf. Even the relatively bad programs have the advantage of involving several of the users' senses at once. Sometimes, criticism of a "bad" program may lead a user to make a more creative and personal approach on his own.

Whenever people enter into exploration that seems exciting to us, we invite them to store the results of their exploration with us in the form of a program.

An implicit part of the learning environment is my own energy as a person who has taken responsibility to work on the learning environment itself. I provide structure for people to try certain things because I am excited by a possibility. In like fashion, I also am structured by other learners who use the environment so that many of the things I decide to spend energy on developing are "requested." If my own excitement becomes an inducement for a learner to try something, then I accept this as a valid aspect of the environment while I occupy it.

I was dissatisfied with the coldness and drabness of our hospital-white walls and so I proposed to several people one afternoon that we begin a mural. *We* did it together (or rather, started it) and it became a group product that was significantly changed in form and concept by the group's decision.

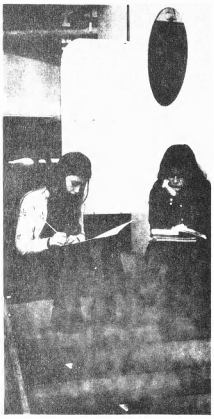
The subject of the mural was a geological cross section of the Grand Canyon, which ended up being done in semi-abstract fashion. Through their involvement in the painting, some of the painters began to look more acutely at real geological maps and cross-sections of the Grand Canyon; some more "conventional" learnings were an outgrowth.

Andy and Steve, as seniors, took an increasing interest in the way we were using our spaces and displaying resources. They spent a whole month, our January term, working to improve the learning resources center. They managed to get two students, Bob and Laura, to do some much more elaborate murals - one of the badlands of South Dakota, another a fantasy scene. Bob ended up covering over our incomplete Grand Canyon mural. (This emphasizes the importance of change in decoration. As the decor changes people find more reason to come back, too.)

Earlier in the year Andy had obtained some oil paintings, prints, and watercolors on loan from the school art collection. They also added plants. These things gave warmth and comfort to the room. Before this the room had been too forbiddingly geological. It was full of equipment that was somewhat organized, but everything was somehow too pristine, too cold, too uninviting for a beginner. Some beginning explorers later confirmed to us that they simply felt intimidated. So a feeling of comfort is essential.

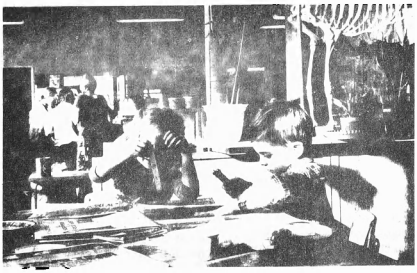
It was a group of students who chose to approach the study of the earth through clay and pottery. Through their urgings, we acquired a pottery wheel, which they assembled. Some of the people who have taken this approach have gotten into problems of clay mineralogy

that are of a more "scientific" nature. Dick, Betsy, Nancy, and Emily decided that finding local clays would be important instead of using commercial, prepared ones. So the five of us got information about local sources, went out to find the place, collected the clay, prepared it, and used it. In the process they ended up doing research on local sources, using maps, examining the stream area where the outcrops were located, discovering numerous things about landslides related to the occurrence of the Massena clay, and dealing with processes of beneficiation of the clay, using grain-size analysis and other techniques. Dick later conducted a mini-course on using the wheel. Arleen joined in this, providing further instruction and also access to a kiln and another wheel that had been set up in one of the dormitories. This was a high-energy node that led to transcendance of conventional boundaries. Incidentally the series of episodes described above took place over a three-year interval from the early project in which Leslie, Becky, and others built our first primitive wheel until we reached a peak of energy culminating in the mini-courses and high energy. Recently, less energy has gone into this activity, and the wheel may now sit idle for a while, awaiting the development of further interest.



Tom spent time over two years, on and off, developing an elaborate experimental device to study aspects of continental drift and plate tectonics. After a number of experiments, he left the device. Other students later tried to do some of Tom's suggested experiments, but with little luck. All learned a lot. Now the device sits idle for the time being. Someone will probably try this direction again next year.

What is used proves its value immediately. What is not used stays in the immediate access environment as long as we have space for it. If we ever get so crowded that choices have to be made and facilities eleminated, we will then deal with that problem. This is not a problem in any beginning science area I have seen. Rather than being cluttered they are generally sterile and empty. A science learning lab full of empty benches, locked cabinets, and with a locked stock-room door which hides neatly organized shelves makes me feel sad.



The role of human geometry in learning situations has recently impressed me. "Human geometry" might be taken as meaning interpersonal relationships in the broad sense, but I wish to use it in a more restricted and mechanical sense here. I refer to the physical arrangement of people and space within a group and the environment it occupies. Are people to be seated in rows, in circles, haphazardly, or how? How about furniture in labs? How should rooms be organized?

The more or less traditional arrangement of desks in rows and teacher in front or behind is not, in itself, inherently evil. Some confluent education goes on where such a geometry exists. In general, however, this geometry seems best suited for what it was invented to accomplish: have a person, as expert, *present* information to a group. If the goal of the group is strictly the transferral of information from teacher to class, then this geometry may be appropriate, but even then the group's retention of the information may be low. This geometry is not, I believe, consonent with the goals of confluent education, in which emotions and cognition are to be integrated. Yet even here, the medium *can* be the "massage," to paraphrase Marshall McLuhan. For example, a motion picture generally has all of the spectators facing front and sitting in rows, yet the show may be powerful enough to involve our minds, bodies, and emotions. For me, sitting together at a compelling film with a group of students or with family has often been a powerful shared experience. Seeing the *Helstrom Chronicles* with a group of graduate students I was working with at the University of South Carolina provided us with a shared experience of cognitive and affective wealth which opened us up to communication later on all sorts of complex educational and personal issues. Yet there we sat, all in a row, our only communication consisting of a common gasp, two hands grasping in the dark, a quick hug, or some other acknowledgement of our shared involvement. Similarly, when ten of us interning at the St. Paul Open School went to *The Exorcist*, our shared experience, even in a "theater-geometry," became a strong binder. In both of these instances, however, the performance was only a piece of our interaction, a stimulant added to the mix. The real sharing occurred more as we went together to the event, as we waited to go in, as we chose partners to sit beside, as we touched each other during the event (both literally and figuratively), and as we replayed the event in later interactions. Perhaps we can learn more about the geometry of groups by looking at films and theater.

Recently, film people have begun to design screens that are wider or that are around the audience in attempts to surround the viewers and to include them within the action. The "feelies" Aldous Huxley mentions in *Brave New World* would be possible extensions into other dimensions of sensation, just as perfumes have already been used in some films and operas. The same is true of a stage play, musical performance, political lecture, or other performance. These can evoke overall group responses and intragroup communication as well as individual response. The difference between these and the conventional classroom lies in an aspect of the "psychological geometry" of the group. The class is usually a required event in which participants are accountable for "understanding" and may be tested on the content of the session. The performance is generally optional, and in many instances individuals have even had to pay in order to attend.

Interestingly, theater people have long been aware of the geometry problem, too, even though, as I have indicated, the geometry of people-in-rows can be transcended to an extent by the power of the show alone. The old "asides" in which actors, from well before the time of Shakespeare confided in their audience, was perhaps a first attempt to break out of the performer-spectator dualism.

Later, actors began to make some entrances and exits directly through the audience, down the aisles instead of from the sides of the stage. I remember the striking affect on me as a small boy of Olson and Johnson's *Hellzapoppin* in the thirties, when actors would come running and shouting down the aisles, spilling things on members of the audience, sitting on people's laps, pulling members of the audience up on stage. Audience participation has become a big thing. In a more serious vein, recent performances of Aristophanes' *The Birds* in the Berkeley Greek Theater and in many other performances use the whole theater as the stage. Actors planted in the audience increase the sense of participation and immediacy.

A few dozen years ago, theater-in-the-round appeared as a serious challenger to the proscenium stage. First movements in this direction occurred when theater people began moving from the proscenium stage with the actors completely out in front of the audience to platforms extending out into the audience. (Many of these more modern changes have been back to geometries used traditionally by the Greeks, in medieval passion plays, and by Shakespeareans.) Finally the stage moved to the center of the audience, with the audience in a circle around the play. Here, the actors had to make all entrances through the house. Members of the audience could see each other across the house, and intra-audience vibrations and energy could develop and be sustained more easily than in the geometry of the proscenium stage. (An interesting variant to this is seen at the outdoor theater in Tampere, Finland, where the audience is seated on a revolving platform, and the stage is the 360 arc surrounding the audience. The

action moves across this seemingly infinite stage-space. This does not lead to audience participation, as such, but it does lead to an unusually striking geometry from a sheer spectating point of view. The very fact that it is a "different" geometry may be a key to its success as a novel cognitive-emotional experience, conveying a new kind of theatrical realism and naturalism.

Current attempts in some experimental theaters aim more and more at directly involving the spectators in the play. Tom Manning, in staging a version of *The Devils*, a medieval piece, had actors moving through the audience in many ways including above the audience and underneath them. He expressed regret that it wasn't yet possible actually to pull the audience directly into the play but that this might finally happen. It is happening in much street theater and guerilla theater - informal use of the drama as a means of generating dialog on political and social issues. Even the old Punch-and-Judy shows directly involved children and adults of their audiences in conversations with the puppets. Bart Teusch tells of his hopes for moving theater as a medium for communication out into various walks of life, to demythologize it and get it into real life, although conventional theater could be retained as well. The use of psychodrama and role-playing techniques in education, management, and therapy bring the theater directly into real-life uses where the spectator-actor dichotomy is transcended. Just as we need to transcend the teacher-student dichotomy.

A second, currently favored classroom geometry is the class-in-a-circle. Just as the theater has moved towards theater-in-the-round, so have classrooms. The circle in education goes back at least to the Greeks, and most of us have an idealized mental image of Socrates seated under a tree, surrounded by a circle of inquirers. William Glasser insists on circles for the classroom problem-solving and encounter groups he uses. This is a common geometry in so-called seminars, although here, the members of the group are isolated from each other by a table that maintains distance.

Having group members in a circle at least assures the possibility of eye-contact all around and may facilitate discussion. On the other hand a strong leader or a teacher devoted to presentation of information can dominate just as easily in this geometric pattern. Arrangement of people alone has no particular significance. I have been in advanced seminars where we, as students, were completely terrified by an authoritarian teacher and were even less comfortable than in a normal class geometry. In such a circle there was no place to hide. This is not a good geometry unless there is openness to dialog. The circle cannot provide the attitude.

Another geometry is the "opposite-ends-of-a-log geometry. In this we have a student seated on one end of a log and a fine teacher on the other - student and teacher engaged in a one-to-one dialog. This is seen as an ideal by most educators. It is an image of Jean Jacques Rousseau and Emile or Ralph Waldo Emerson and Henry David Thoreau. Yet some teachers would, in fact, be terrified of such a relationship. Such intensity leaves no room for hiding.

Open-school geometry takes many forms. The present preoccupation of public school systems with open space schools demonstrates a growing awareness school boards and administrators have developed of geometry as a factor in learning situations. Here, the cart has often gone before the horse. Wide-open spaces have demanded openness, consideration, diversity, and alternatives from teachers who were psychologically unprepared to handle them. Still, one has to begin somewhere, and open-space has provided an incentive for many teachers to review their philosophies and practices.

In the long run, changes in geometry of space and time - physical plant and scheduling - have helped many teachers, not without a lot of pain, redevelop and humanize their teaching practices in the direction of greater confluence. Practices such as imposed modular scheduling represent changes in the time-geometry of the school which have led to at least some increase in flexibility, with attendant awareness of the needs of individual learners.

The organizational geometry of the school has been changed through the increase in team teaching and other factors that change away from the normal geometry of classes that are all roughly the same size and with the same teacher-to-student ratio.

The geometry of truly open schools becomes a fluid pattern in which each learner develops his own individual geometry. To some people this might at first appear to be chaos or anarchy. The nature of such "anarchy" has been discussed at length by Judson Jerome in *Culture out of Anarchy* and *Families of Eden: Communes and the New Anarchy*. The word "anarchy" is, in a sense, a semantic trap, and, in practice, "open" programs can provide a caring kind of flexible geometry that provides many optional scheduled events and many well-organized alternatives as well as freedom for learners to follow individual paths. There is constant flow between activities that are individual and those that involve groups. In a sense a moving Moire pattern might provide a useful analogy: individual lines moving and coalescing, shifting patterns, and yet a good deal of regularity to the person who understands the origin of the pattern. The geometry of fluidity has its own special laws and characteristics just as does the geometry of a rectangle or a circle "drawn" by a teacher. The locus of leadership shifts about in such a geometry much more easily than it does in a teacher-structured geometry. I have discussed the concept of "migrating leadership" further in *Risk, Trust, Love* and that of "leaderless groups" in *Consciousness and Creativity*.

As an example of the way in which geometry can change and how an initial, conscious

shift in geometry can facilitate changes in attitudes and practices, I want to describe some changes I observed in our geology-geography program as we moved toward a more confluent style of education. At the beginning of our first year (Fall, 1971) we had a 3-day departmental retreat at a lodge in the Adirondacks. Our first all-group get-together involved our getting together, all sixty of us, in a large-group meeting one evening. We conducted a fish-bowl exercise in which the faculty members sat in a circle surrounded by a larger circle of students. The geometry was novel, and this helped us to develop some interaction. Still, although this session at least got us all together for some "serious" talk as a group, the number of students who participated was relatively low. I am sure there would have been a great deal of uncomfortable silence and waiting if we had not had a faculty group to do much of the talking. Back to the old pattern of faculty talking - students listening, except for a few brave souls who joined us.

I had often been a member of circled-up groups where we all participated in "the great silence," until someone would become so frustrated that he or she would blurt something out. Often, the thing blurted would be an expression of frustration and hostility - hardly a good note on which to begin the building of an environment of trust and participation. Yet you have to start with the feelings, fears, joys that are present in the group to begin with.

At that retreat, the most significant geometries that developed were the more informal ones. Dining together probably was the most significant group event, as such. So were walks by small groups in the woods, or the one-to-one geometries of sitting on the porch together or rapping with a room-mate before going to sleep. There was no way to force attitudes favoring confluence, and the large-group fishbowl may not have been a particular "success." There is no need to attach any particular positive or negative value to that "device," however. It was to be one of many tries to provide an environment - a geometry - where interaction might occur. In a special interdisciplinary studies course on problems of developing countries we recently tried another fishbowl. That group involved many people who were apprehensive about grades and "looking good." Here, too, I felt that the fishbowl at least presented the concept of alternative geometries for our class group of about fifty people and that it helped to facilitate an increasingly confluent mode of interaction and learning in that group.

Six months after our initial group retreat, we held another such overnight meeting. Upon arriving, we cooked and broke bread together. Soon after the meal a group of a few people had formed in the large living room and a discussion of progress and problems in our program began. Someone asked me to come up and join. I entered the discussion. Before a half-hour was up the room was filled with about forty people, most of the people who were there for the retreat. (It is significant that *not* all people participated, for this showed a comfort they felt in rejecting this event - an essential dimension of a truly confluent and open environment.) The geometry of how people were sitting fascinated me so much at times that I failed to listen to the discussion. As opposed to the formal, concentric circles of six months previously, bodies were spread out everywhere, at all angles, draped over chairs and couches, on the floor, propped against the walls. The conversation went on easily and unhurriedly. There were silences, but no one felt compelled to break these. They were comfortable silences. People came and went.

During the summers of 1973 and 1974 we conducted leadership programs for the ES materials. The initial workshop for each of these lasted two weeks and were held at our mountain retreat center on Saranac Lake. We began each conference with two days of encounter groups. Each group consisted of twelve to fifteen participants (teachers, supervisors, principals, curriculum specialists, and university professors) and two of our staff facilitators. These groups, as seems true of all first attempts, felt strained and uneasy at first. Gradually the comfort in the groups increased as strangers came to know each other. Eating and playing together, augmented by informal groups and pairs interacting, undoubtedly helped. (I wonder if we might not have reached the same stage even without the encounter groups?)

By the third full day we were ready to proceed into our informal program of multiple alternatives. After breakfast we scheduled a "community meeting" of all seventy participants. One of us on the staff announced that the meeting was for the group and that we would not "lead" it except as we, as participants, wanted to communicate our feelings, ideas, and information about activities we wanted to offer. Silence followed. The geometry of people in the room (a large open game-room with wicker furniture and window seats) was of the very informal type, with people strewn about all around the room. Even some of the older people who would strike one as rather conservative and formal people appeared relaxed and at ease. As staff, we stayed out of it for a while. Soon ideas started to come.

We continued these community meetings each day, and over half of the group - often virtually everyone - attended. At times we had little to talk about and we sat around and talked individually with no statements or announcements being made to the whole group. At other times several people had issues to raise which took an hour or more to work through. At one stage when some of us on the staff got apprehensive because we couldn't see how things were developing, we did a staff fishbowl to get our feelings out. This one elicited a great deal of participation from

the group and helped all of us to empathize with each other. Meal-times and other informal group meetings provided other times when people could communicate with more or less the whole group.

In a summer earth science and cultural geography field school, Bill Elberty and I recently worked with about two dozen students for a month. We tried to establish the idea of community meetings there so that participants could communicate with each other. This time we did not begin with encounter groups. The participants were not, for the most part, living together as a group, and Bill and I were living at home with our own families. The community structure never did get off the ground in quite the same way as with our ES groups at least as far as the community meetings were concerned. When fifteen or sixteen people showed up (rarely), some dialog took place. Usually, we seemed to lack a critical mass in terms of the number of people. Since we were not eating or living together the group structure just didn't really come together. Then we took fifteen members of the group on a five-day odyssey across New England to Cape Cod. We studied the geology, geography, climates, people along the way. The group "came together" into a supportive and confluent one by the end of the first day. The *geometry of confluence* seems to require some minimum "closeness of packing" within time and space. There must be dimensions of critical mass to satisfy that involve the number of people, the number of hours they spend together, where they are living, whether or not they eat together, how their interests merge in terms of intellectual goals, and other factors.

At one retreat I attended as a consultant, about 100 college faculty members, the dean, president, and some trustees from a college met for several days to plan for change and improvement in their programs. Great informality prevailed for much of the time, with meals taken together, group cocktail parties, etc. all arranged. However, the "formal" sessions were just that: all 100 of us seated in rows, with the speaker on a dais in front of the group. After each of us who were consultants had his or her say then the other consultants became a panel for discussion and response. At the very first meeting I mentioned to the group my awareness of the geometry I saw and I predicted that they would make few inroads in planning for a departure from presentation-oriented instructional patterns at their college as long as they continued to conduct their own planning session in a format that preserved the very geometry they *said* they wanted to transcend. Everyone agreed, and yet no one took any real action to break out of that habitually formal geometry. Over several days, frustrations seemed to mount in the group. I continued to plant the notion that they were prisoners of their *own* geometry and that *they* would have to take initiative to get out of it. As my turn neared to make my own "presentation," several younger faculty members urged me to help "break it up." So, we finally managed to break the group into smaller groups - not a very big, significant, or innovative thing for us to do. But the whole tone of the meeting seemed to change - to the relief of many people - and real communication and planning began. It is essential for groups to become *aware* of their geometry and of the effects that it has on the dynamics of their processes as a group. In that instance, we could *use* the geometry of the group to make a principal point about their whole planning effort and potential directions for change.

An outside consultant or visitor or an insider who takes up the role of change agent can thus help a group to break out of one geometry and to try others. In an interdisciplinary studies program based mainly on large-group lectures, I was asked to experiment with different geometries. Every fourth session we tried panel discussions, small-group work, fish-bowls, large-group discussion in informal living-room-type settings and other formats as well. Our experimentation helped us all get into better interpersonal communication. Warren Bennis provides a good discussion of how a person identified as a change agent can help a group study and improve its organizational geometry through setting up plans for change. In our interdisciplinary studies group we now have plans for a radically redesigned approach to group activities to bring the students more definitely in as partners rather than just as "consumers."

Meetings that the National Science Foundation has held for peer-review of proposals and planning for future directions have traditionally involved moving back and forth between small-group panels and large-group presentations. Generally meetings are held in big-city hotels where participants have little sense of contact except at these more formal sessions. Recently, they have adopted for some meetings a retreat format where participants have been isolated in the country (at Airlie House in Virginia, for example). Meeting colleagues in the swimming pool and on the terrace provided more important working geometries in the sense of an environment for exchange of significant ideas than did the formal meetings. One of the division directors still expressed to me his fear of blank time-slots on the schedule, however. *Yet it was in these "blank" time slots that the most significant exchanges occurred,* and not in the geometry of the large-group meetings. The large-group sessions actually interrupted the important business of the meeting.

In my experience and in things I read, it seems that the surest ways in which to create the informal geometry of a confluent learning environment involve inclusion of specific provision for situations that increase the possibility of some intense interpersonal experiences where people can reside together, eat together, be together in out-of-"class" contexts.

Residential programs almost always seem to "work," even if they involve only a few days of intense physical togetherness. Encounter groups, field trips, camping trips, retreats all help break through the more formal geometries of the school.

Once an attitude - a psychological geometry - for confluence grows in a group, then very good kinds of interaction begin to occur spontaneously even in the formal setting of an auditorium. For my own part, I find that the informal room - the studio, living-room, recreation-room-with-bean-bag-and-cushions or the campfire model of informality best serve to break out of the confining psychological geometry that has conditioned most of us. A carpeted corner in a classroom (a magic carpet as some have called it) may do more to begin in this direction than many other more conventionally defined educational resources.

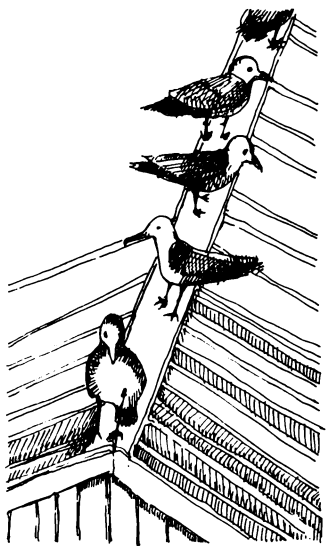
If emotions and feelings are to flow freely with cognition, learners and teachers must all occupy psychological and physical space that feels comfortable. Geometry as both a literal and metaphorical, figurative concept is a prime factor of which learning facilitators should become aware.

As I wrote the above paragraph an image flashed into my mind of sea gulls sitting on a roof-top. Gulls have an apparently fixed "social distance" as do many other animals. They rarely sit closer to each other than a fixed number of feet apart. If one gull sits down too close to another, he may get attacked. As one gull flies away and a "space" opens up, another may settle there. But given a fixed length of roost, only a certain number of gulls will settle.

The notion of the territorial geometry of various animals in terms of their living space has been well discussed by Ardrey and others, based on the work of Konrad Lorenz and Nicolas Tinbergen, whose work was recently recognized by a Nobel Prize.

Experimental studies of rats have shown that, in overcrowded cages, the animals fight and attack each other seemingly without provocation.

People, similarly, develop social distances in a somewhat regular way. At a cocktail party, for example, just watch the regular distances that people leave between them, just like so many gulls on a roof-top. If it gets too "crowded," conflict begins. It's a fascinating game to step inside someone else's social distance once you've discovered what it is. They often step back, and some people can be marched around all over a room. The social distance factor differs for different people and depends on the relationship between people. Teachers often keep a relatively long social distance from students. This appears in forms of address, in the lack of touch between many teachers and their students. (They are literally as well as figuratively "out-of-touch.") Man, more than other animals, probably can transcend any "instinctive" social-distance factors. Our evolution is more a cultural evolution now than a genetic one, and we can evolve in a conscious way if we allow our awareness of inhibitors to develop. To me, a long social distance inhibits community. A lack of community inhibits group contributions to confluent education. For my part, I seek to decrease my social distance factors. Indeed, when I have seen open and confluent educational patterns developing, I have been aware that the geometry of that "normal" social distance no longer exists and that more nearly familial and communitarian absence of fixed social distances prevails. Even "strangers" are quickly allowed inside of the limits that are imposed on strangers in a non-confluent environment.



CONVIVIAL ACCESS

To me, one of the fundamental aspects of the learning environment is *access*. In most conventional schools, elementary, secondary, or college, when I go into the science area I find empty benches, empty chairs, locked cabinets and a locked stockroom. Even when students are present in the room, only *certain* drawers are open, and access to the stock room is far from free.

On a visit to a middlewestern college I agreed to run some labs. My first assignment was, "Find some minerals and make esthetic judgments about them." The stockroom, halls, and campus were all fair game as far as places to look were concerned. A mass of people headed into the stockroom. Even though this was, relatively speaking, a poorly equipped school, there was a veritable feast, and the people were clearly starved for access.

At another university, in an in-service program for science teachers, we used the facilities of one of the natural science departments. I used to dread going into those tantalizing rooms with all of their locked drawers. Here it was, a major university with Ph.D. programs, big-time research and the whole thing. And they complained about their lack of materials for lower-level students. There was no lack of materials at all. Only a lack of *access*. And of the trust you have to invest in learners if you expect to provide them with a worthwhile working environment. For one of our evening sessions, we finally scheduled "exploration night" in which we insisted that the department chairman unlock every door and drawer in the whole department. Well, he wouldn't quite go *that* far, but he did arrange to have several faculty and graduate students around and things were several hundred percent more accessible than at any time before. We had one of the best nights of the year, too. From then on, access improved. Even though I never did get over the feeling of closed-ness all around me, our people could get into most areas (under supervision at first and later, to some degree, without).

It's a little like the librarian we had in one natural history library where the focus was, "Every book has a place and every book should be in it's place." The collection was a display rather than a functional part of the learning environment. "But they'll steal the books." O.K.! God bless them! Then at least we know they're being used!

Russ was inconvenienced when he found some lab set-ups being spoiled by the theft of small items. He finally announced, "If you want a quartz crystal or a lab hand-out sheet just tell me, and I'll give you one." Some of the missing materials began to reappear. A few people came in to ask for materials, and Russ gave them what they wanted. There will be a small cost involved, but the set-ups may now remain intact so that people who *want* to work with them will not be inconvenienced.

People *can* come to take care of an environment to which they have free access. But don't expect it to be easy! We are working terribly hard to keep open and still have our equipment in functioning condition and in place. At first we found that people were borrowing equipment from one lab to use in another. This ruined set-ups and you'd have to spend literally hours reassembling gear in order to do what you had had all set up the day before. It always seemed easier to take someone else's stuff instead of ordering more for yourself. So, free as the environment was supposed to be, individual learners started to cache their stuff and lock it away again. Now it wasn't the faculty who were closing down the access; it was the *students*.

We left the darkroom open and people never cleaned it up, so the person in charge of supplies and maintenance started to close down. The person who's going to tend it this year wants to start locking it again. I'm not ready to admit defeat there.

Our basic introductory exploration center is open from early morning until the campus security police close it down. Often people are there all night long. Since I more or less control that space, I won't accept a locked door there.

We made a general master key available to our majors and to others who wanted special access. The master key disappeared after about six months, but there have been no major thefts, so we suppose it was simply lost or misplaced. Still, the university does not want many of these keys out, so replacing it becomes a problem.

I leave my office door open 24 hours a day and nothing significant has "wandered" in nearly two years. My books are getting terribly dog-eared. I rarely come into the room, even late at night, without finding the light on and someone using the room and its equipment. Often there are people I don't even know. That way I have met some students who have become "best friends." I like it. I worried a little at first when some favorite books disappeared off my shelf. They were back at the end of the year. I worried when some data for a study I was doing disappeared from my files, which I also leave open at all times. They were returned when the student (not even one of "my" students) whom I had told about them one day had finished perusing them. I am inconvenienced a number of times. But I also now have the feeling that maybe it has been worthwhile lugging all of those old books and files around all of these years after all. My books have gotten more use during the last couple of years than in the whole of my previous teaching experience. This year, graduating seniors even started to leave some of *their* books for my room!

The best part is when someone just comes in and sits there, without even necessarily

wanting to talk to me because, as they have sometimes said, "I feel comfortable and at ease here in this place and that's not true elsewhere." In my pigpen, they feel this way? That makes it worth whatever happens to be borrowed and not returned.

The room has really stopped being "my" office. It's a departmental work room. That poses problems for me, in that I don't always have a private place for myself. I have had to relegate much work where I need aloneness to a small work-room I have at home. Nonetheless, I feel good about this redefinition of my "office" into a more "public" kind of space. In a number of well-functioning open schools I have visited, teachers have this situation to deal with. Openness of facilities leads to a lack of privacy and a need to redefine and reorganize many behavior patterns.

There is always a possibility of outside raids and we must recognize this real-world risk. The best way to deal with it, I feel, is through *really* open access and well-developed relationships among people. If most spaces are occupied regularly by people who work there because they like the place, then you don't have to fear burglaries from outside. At Syracuse, we used to leave our elementary labs open in the evenings. One night John Gibbons, one of our graduate students, came upon a person trying to make off with several hundreds of dollars worth of stereoscopes. The fact that John and others were around and *cared* was the security we needed.

I have lost fewer of my own books and materials over the last couple of years than ever before. Maybe it's *because* the doors have always been open whether I have been there or not. Many other people I know lose books even though they keep their doors locked.

Openness or *convivial access* in the learning environment has with it a cost of doing business. Without fixed procedures and policies, problems have to be handled on a situational basis. I have to respond to what really happens rather than to what was or is supposed to happen. We *will* lose equipment. We may someday be victims of a real and disruptive burglary. People *will* have experimental setups knocked down. Becky *did* lose a roll of film because someone got annoyed that she left it in the drying cabinet for three weeks and threw it out. Somebody *will* get sand into the pinion gears on the good research microscope. Someone *will* lean on the edges of our plexiglas experimental flume and cause a leak. Someone *will* leave the big rock-slab saw untended some Sunday afternoon and burn out the motor. These and many others are part of the cost of doing business. They are real costs of having convivial access in an open learning environment. Notice: I said a *learning* environment. If access leads to learning, then the problems are worth putting up with and dealing with. As a matter of fact, dealing with the problems of living together, working together, learning together, being sensitive to what others are doing and feeling, taking *care* of materials in an environment and caring for each other and each other's learning may just be the most important part of a learning experience. - Or should I say a *living* experience?

This year, in order to encourage a higher level of energy in our lab spaces, I plan to open the labs up to the general public in our village. We'll announce open hours via the local newspapers and radio stations. Energy breeds energy... chain reactions. But a critical mass of people and energy are needed. For too long, resources have been locked up within schools. John Holt emphasizes this in *Freedom and Beyond*. Schools need to become open, community-wide free resource centers. As the school opens to the community, so will the community open to the schools. Both schools and community can only profit from such confluence and integration.

THE "DEGREE-OF-USE HYPOTHESIS"

As Russ and I talked about problems of access and of the maintenance of equipment and spaces last week, an hypothesis came to my mind:

> *Spaces and equipment are maintained and kept in functional working order in proportion to the degree of use they receive.*

What this means is that a piece of machinery that is only used occasionally will almost always provide the user with mechanical or electronic problems (or both) of many types. The user will thus be constantly frustrated and will avoid using the machine if at all possible. Few people in the environment will learn how to use it because it seems so cantankerous and unreliable and it will gradually become a museum piece.

In several research labs, I have found that when equipment is so much in demand that you almost have to sign up for times to use it, the machinery is generally in fine condition and users don't need to spend lots of maintenence time. Enough people get to know the machines and their special little habits that there are *lots* of potential repairmen around who know how to make simple adjustments. When there is heavy use, strangely, it is easier to get access to professional technicians who can look in regularly or where servicemen are obtained on short order for more major problems. Use breeds more users. Vitality, efficiency, good data, and good education result.

With respect to spaces, I find that the most intensely used labs and spaces, those in which people are always working, seem usually to be the "neatest" and "best kept" *from a functional point of view*. The neatness I refer to is a kind of casual order in which you know that every piece of stuff out in the room has either just been used or is just about to be used - such as in the shop of a skilled artisan. There may be lots of debris around, but each day the debris is different debris and the things lying around are different things.

On the contrary, when spaces are infrequently used, I find the *same* debris lying around for weeks or months. The spaces may be unclean. They are uninviting. I get a feeling of "no one cares." Since the room is uninviting, people don't come in and the place gets worse and worse. If I find much stuff out on tables that has not been used for two or three weeks I feel that the space is underused.

We have very good spaces in our science group. Lots of big labs. Yet most of them are poorly used. Even so, some of our people are asking for *more* space rather than reinventing better uses of the existing spaces. As we spread out, we create more badly used (= occasionally used) spaces and the old junk, the debris, and the debilitated look of the place increases.

What we need to do is to reinvent better *use* patterns, not to get more space and continue to use it badly.

When spaces are being used at something close to capacity, each person who leaves feels pressure to clean up her or his stuff. Someone will almost always still be in the room when I leave. The group will see to it that I don't leave a mess. When someone is waiting in line to use the darkroom, the person next in line puts pressure on the person preceding to leave the darkroom in order. When someone is "next" on the x-ray machine, he'll be likely to have an effect on the condition in which the x-ray machine is left by the previous user.

Obviously a matter of balance is involved. It is possible to get spaces so over-used that people begin to fight each other just as rats and deer do or make a mass exodus the way lemmings do when their life-spaces become so overpopulated that high stress pervades the environment.

But in general I find spaces and equipment grossly underused in schools. The problem is one involving the frustration and stress produced by lack of use, to which lack of access is a major contributor. Interestingly, in several open schools I have visited, even though there are as many or more "students per square foot" as in conventional schools, I get a feeling of lack of crowding, of plenty of room. In conventional schools with the same or even less favorable ratios of people to space I feel crowding of spaces during a small number of hours and total lack of use for more than three quarters of any given day and half of the year. We don't need more money for buildings and equipment, we need new use patterns in schools at all levels. I believe that nothing short of total reorganization of the concept of schooling can solve this problem. Open alternative schools and programs provide a way of testing new concepts of space use and access.

A DIATRIBE AGAINST LOCKS

I just went looking for the key to the new xerox machine. It took all last year to get the administration to install one in our science complex. So where did they put it? In a locked library space. So we got a key to the library space. Mark was supposed to have the special "counter key" for the machine, so I got my key to Mark's office (his can't be opened by the master key). It wasn't there. I tried Alice's desk. She was away today. Her drawer was locked with the counter key inside it. The search took twenty minutes. I was in such a bad mood by then that I just went home. A year's work to get in a machine that I couldn't even get access to. Right down the hall! Locks!

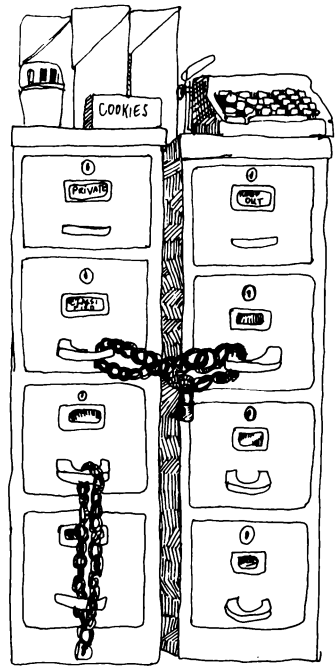
I wanted to photograph some crystals one of our people had collected this summer. I couldn't find her. The drawers she has claimed for her use were locked. All of the drawers in that room have the same key. So about eight or nine people have keys. Someone even took the file-key, so I couldn't use that either to get more made. We've had to borrow a key from one of the drawer possessors.

Several people want to lock the darkroom. I resist it. So they've locked up all of the chemicals and things,and you have to run around for a half hour to get anything.

At geology club several people talked eloquently about how anyone who *really* wants to use the equipment won't mind looking around to get the key. Access is open, after all. All you have to do is find the person with the keys! Five minutes? A half hour? Why not come back tomorrow, when the person with the key shows up? Why not make Bill or Alice "keeper of the keys?" They haven't anything better to do!

What happens is that locked facilities don't get used. They petrify and gather dust. They look fine, if a bit dusty, but contribute little to the functional learning environment.

I resist and fight locked doors. It may be a losing battle. People have to learn to trust each other *on their own*. I can keep expressing my frustrations. I can keep leaving doors open. But many people have such strong territorial feelings! Ardrey talks about them a lot in his book *Territory*. So does E. T. Hall in *The Hidden Dimension*. Is territorialism and the attendant need for locked doors such a basic human quality that I simply must accept it? Or are we big enough to transcend, through cultural evolution, what may once have been a basic biological property of our species? I am bold enough to think that we *can* transcend the need for locks and that open learning environments may provide a mechanism. One thing I do know is that locks bug me! They inhibit my access and my productivity. They lead to waste of time and energy.



The total environment for exploration and browsing also includes the direct inputs that I as a "learner-leader" and others, from the least experienced to the most experienced, choose to make. In discussing inputs, I shall include many input forms used in the groups I am presently working with. These forms can be applied in any group, at any level, with appropriate personalization and identification.

Input forms are many. They include things like group meetings, talks, films, demonstrations, programmed learning materials, led field trips, and even examinations. For the most part I consider that all of these should be public events, as widely publicized as possible. I do not wish to restrict attendance to class groups either by the way I schedule them or by the way I disseminate information about them. For some kinds of inputs it may be desirable to restrict the number of participants or to establish some prerequisite of minimum commitment or common background. But any oversubscription in terms of numbers makes we want to make new attempts to schedule additional inputs of similar type so that as many people as possible can always be accomodated.

What happens is that many people who are not "taking" earth science with us, come to some of these events. In this way they partake of the environment we have available. When and if they do join us for "credit" work they are apt to come in already motivated to use the confluent environment effectively and in a more self-directed way. Better information leads people to better choices and decisions.

Each of the following essays concerns a specific input I wish to discuss.

TALKS

Dana Abell, in an article that appeared in the newsletter of The Council on Undergraduate Education in the Biological Sciences (CUEBS), states that lectures are good for a multitude of purposes, one of which is *not* the transmittal of information. He goes on to provide a variety of ideas for using lectures in such a way that they serve their best purposes: stimulation and inspiration. His "types of talks" are reviewed below, and amplified with examples from my experience:

1) *The "come with me" lecture.* This is a narrative of inquiry. The talker works his way through the actual inquiry process which a group of researchers followed in making a specific discovery. Ideas for such lectures can be gotten from books on the history of science, from research papers, or from conversations with researchers, who might be asked, "Describe to me just how you went about your studies, what clues you followed, how you felt, etc."

2) *Glimpses of great men.* Well-known scientists can be invited to come and reminisce before a group in a more or less informal way. TV tapes and films can be used if "live" scientists can't be found. The American Association for the Advancement of Science (1515 Mass. Ave. N.W., Washington, D. C. 20005) has a whole series of short filmed and taped interviews with scientists.

3) *Flavor of the past.* A case study-historical vignette about a specific discovery can give a sense of flavor to how science has been done.

4) *Dialogue, live interview, debate.* Two or more people exchange views before a group, with or without the group's participation. Bill Elberty and I led a big beginning geology course involving about 150 beginning students in Fall, 1974. Both of us were present at each "lecture." Often we would perch on a couple of lab stools in front of the amphitheater and proceed to discuss a topic of interest. In some instances, we had loosely "scripted" what we wanted to go through. At other meetings we would go in "cold" to see what would happen. At times we would break the group down, or at least offer two alternatives with one of us inviting a sub-group from the whole class to go to another room with us. In some of the dialogues we were led into all sorts of unusual areas of interest. Our listeners saw us involved directly *in process.* How we were thinking and approaching problems was far more important than the particular information we were conveying. Interaction with members of the group happened often. Even though these sessions were fully optional, between a half and three quarters of the people registered showed up at any

given session (with sessions being held at least twice a week).

At some meetings, one of us took primary responsibility and came in prepared to deal with something specific, which we announced via a blackboard in the hall. When one of us "took over," the other became a reactor and interrupter. Since we interrupted each other, this "gave permission" to the others present to interrupt and question, too, and group participation was higher than I have ever seen it in such a large group.

5) *Paired antithetical lectures.* Two lecturers with opposite viewpoints give separate lectures. These can be "staged" or real.

6) *The challenge lecture (role playing).* A lecturer can present evidence in support of a a mistaken view. John Merrill once presented to a junior high school science group talks and exercises based on the Ptolemaic view of the universe. The class finally began to challenge and push him. Dana Abell, in his CUEBS article, gives an example of a professor in a Nazi uniform delivering a lecture on genetics from a Hitlerian point of view.

Neal O'Brien, Bill Kirchgasser, and Jim Carl from the State University of New York College at Potsdam have for several years staged an "annual meeting of the geological society of Freiburg, circa 1812," involving a heated debate favoring the now largely discredited idea of "catastrophism." This has generally been a presentation to their beginning geology group. A little tired of repetition, they asked me to join them by taking up some other role and becoming a "ringer" in the audience. O'Brien portrays a scholarly president of the academy; Kirchgasser, a berobed Abraham Gottlob Werner; and Carl, in top hat and cutaway, plays the role of James Hutton, the "father of modern geology." I elected to play the role of Leopold Von Buch, a student of Werner's who went on to become a famous geological scientist in his own right and later had to turn from the teaching of his master and embrace the contradictory ideas of Hutton. The "performance" turned out to be great fun, and the rest of the audience soon jumped into the fray, participating for all the world just as their predecessors in Freiburg might have done one-hundred sixty years earlier. Experiential learning was fostered in this event.

Such role playing need not necessarily be of the "challenge" type either. It can also be just a device for bringing new realism to old ideas by using theatrical techniques. Why not use drama as a classroom tool? A biology professor at the University of California won recognition in the popular press for his classroom dramatizations in which he appeared before his classes, costumed and made up as Mendel, Linnaeus, and other major figures in the development of biology. He achieved success in giving an experiential quality to input in the form of talks.

7) *Analysis of the views.* A major newspaper such as the New York Times is used as required reading and the instructor probes the news.

8) *Non-scientists look at a science.* A group of people from outside the science fields (business-people, ministers, musicians, artists) form a panel to discuss "what's wrong with science." If a specific science discipline is involved, people from other sciences might also be included. Many other topics could also be chosen: evolution, abortion, euthanasia, values questions of all sorts.

9) *Programmed lectures.* Just as there are programmed textbooks, a talk can also be given in a "programmed" way. A method such as this may be especially useful if you have access to an auditorium with direct student response capabilities. At Syracuse University, for example, some auditoriums have each student seating place equipped with four buttons. The lecturer can ask for responses to questions, and the responses, punched in by listeners from their seats, are tallied on a small computer, giving instant feedback to the lecturer and the group.

10) *Concentrated visual experience.* Visuals in the form of slides or films take the place of most of the talk. They can be followed by commentary, shown silently first and later with commentary, followed by quizzes and repeated for immediate feedback, etc. We have frequently used color slides with assignments such as "You have five minutes to describe what you see in the slide," or "Interpret what you see in this slide," "What is the most important thing in each of the following slides," etc. These can be used for value-clarification exercises, asking participants to make and defend choices. There need be no right answers, but the technique leads to a great deal of interaction.

11) *Multisensory experience.* "Psychedelic lectures" can be effective as invitations to integrate perception, emotion, and several kinds of subject matter. Two or more slide projectors, bioscopes, polarizing projectors, tape recorders: all of these and more make it possible literally to surround listeners with sensations. I have often tried to combine sound and sight shows around the theme "patterns in science," hoping to generate interaction in groups of participants.

The "devices" used can be very simple, too. When we designed the film *How Solid is Rock?* for ESCP, we wrote a guide suggesting that teachers pass out small blocks of paraffin for viewers to "play with" during the film. The way in which they played with the paraffin and what its physical properties were later became part of the discussion: "How is paraffin like rock? What is a solid? What is plasticity? How brittle is 'brittle?' etc."

At a meeting of The National Science Teachers Association, several of us gave a presentation in the form of a "play," entitled "Schools would be better off without science." People entered the room to find the chairs in chaos. They sat here and there, facing various directions. At a certain time, the lights mysteriously dimmed, and a moving picture pro-

jector began to show a film called "Garbage" on one wall. Soon a second projector came on, and a second film began. A slide projector set on automatic change soon added further visual material. When the films were done, they were allowed to flap, flap, flap until one of the participants, in a state of frustration, turned them off. Finally, a person we had "planted" in the audience of over 100 got up and started to storm out of the room, muttering loudly that he had better things to do than play these games. A second "plant" said, "Well, I'm going to wait around for a while; the program said we were supposed to be the participants in this play, so I'm curious enough to see what we'll do!" A third person, not a "plant," began to talk further about the experience he was having and about our topic for the play. The discussion went on, in a self-led manner, for an hour and a half. Those of us who were "staging" the play sat quietly and listened to the interaction. This was group process at its best, and yet it started as a scheduled "presentation."

12) *Scrambled lecture.* Abell suggests lectures in which words or sentences are offerred in virtually random order. Or two lecturers might talk at the same time, each trying to get attention, using whatever devices they wanted to.

13) *Lecture experiment.* Demonstrations in which speakers actually perform experimental work in front of a group have long been used as attention-getters. They are especially popular on television science shows. A highly successful gimmick I've used involves the growth of crystals of thymol magnified by an overhead projector or bioscope.

* * *

I like to give talks, and I do a pretty good job with them. Entertaining people is fun. However, I want people to come because they *want* to rather than because they're scheduled to do so. During recent years I have been giving certain regularly scheduled "lectures" in connection with beginning college-level earth science courses. I have tried to turn these into dialogues and "experiences" or at least potential ones for those who attended. Attendance has been completely optional and groups have known that I would not ever give an examination on the information covered and that no one had any responsibility to recall or be accountable in any way for anything said. Further I have invited people to leave at any time and said that if they were bored and *didn't* leave, that was their problem and not mine. For some talks, I set the group up into activity sessions where the larger group is broken up into subgroups for various purposes. I use slides extensively. I refer very little to books and terminology, but try instead to communicate what I can of my own personal experiencing in any given area. What *I* have to offer in a talk is not a recapitulation of textbook materials according to any schedule but rather a presentation of personal experiences most likely to convey my feelings, emotions, and approaches as well as whatever cognitive materials (= conventional subject matter) might be involved. What I have to offer can be looked at by some people as primarily for entertainment value, because I have no expectation that anything of what I say need be retained or learned. Strangely, I believe that as much or more has been functionally learned by people recently as in much more information-centered talks earlier, and I have enjoyed the process of communicating in that way on a level at least a quantum jump ahead of what I felt in past "lecture" arrangements.

I used to write out things in great detail - to virtually re-do a group of textbooks and outside resources. Then I would rehearse the lecture carefully. When I presented material, I rarely used the notes, but my mind was well programmed. I used to worry about whether or not I'd have "enough" to fill fifty minutes. What could be worse than "finishing" early? "They've paid for a full fifty minutes." I developed a rapid-fire, machine-gun delivery. And it seemed to me that the less I knew about a subject the faster I could talk about it. Throw out a blanket of snow! And everybody marvelled, "What fantastic ground you cover."

Bob Lepper, in consultation with one of his Deans, defined the usual lecture preparation technique in an apt way: "What you do the night before is to read up on a bunch of stuff you've forgotten and then you recite it the next day just as if it's a really functional part of your knowledge. Then you forget it again until next year. But, you do test the class for it and expect them to demonstrate that they remember it!" I can remember having to look in my notes to copy certain chemical formulas on the blackboard during a lecture and then expecting the class members to reproduce them from memory on a test. Or, more interesting yet, have you, like I, had to look up an answer to one of your own test questions before you could grade it?

What I am trying to do now is to come up with topics that excite me at the moment. I have mainly avoided conscious rehearsing or detailed planning. First there has been a germ of an idea running through my mind. I pin key words up on my bulletin board from time to time and sometimes choose one of those as a topic. One afternoon when I really hadn't decided what I wanted to talk about I asked Tom, one of the people in our group, who was in my room at the time talking about an elaborate scale model experiment he was conducting, what he would like to hear about. He said, "Shorelines." So I elected that topic. I went home, gathered appropriate slides, and the next day we had a good slide-discussion on shorelines with a good deal of group participation accompanying some of my own presentational inputs.

A few hours before the scheduled talk -

perhaps the night before - I have sat down with the germinal idea and jotted down, randomly, everything that comes to mind from the word or theme. In several instances I have taken a word - like "volcano," for example - and then gone to my collection of color slides, picking out all that somehow, in a half hour or so, I could relate to volcanoes. For "volcanoes" I found that I had about two hundred slides. I had previously had no idea I had experienced so much with respect to volcanoes. I perceived that I "knew" a great deal more than I thought about what was "supposed to be" a relatively thin area in terms of my personal experiences. Now the problem became one of *limiting* myself rather than of filling fifty minutes.

The next morning, I put the two hundred slides out on a light table where I could get an overall look at patterns I might invent from my own photographically-recorded perceptions of several years. I took out about fifty or sixty of the slides and established an order based on the patterns that appeared. I avoided rehearsal or verbalization related to the slides, wanting to see what would happen when I let all of me respond to the slides, in that order, when they were flashed onto the screen.

The talk became an hour of invention. The group of perhaps seventy or eighty people that were there began to participate, asking how I felt about certain things I said, how did I know this or that, and what do you call that thing over there? We participated in a shared experience where all, not the least of them myself, were achieving new, and truly experiential, learning about volcanoes, vegetation on volcanoes, science processes, volcanic rocks, people and volcanic history, and many related areas. We only got "through" half of the slides in the stack. The group decided to continue with this experience the next week. Lab materials related to volcanoes were brought out in the learning resources center and some people chose this experience as a take-off point for more focused exploration of their own.

After a couple of these experiential topic shows we sat down together and talked about whether these should continue. The first suggestion, shared by many, was that I talked too much! So we cut down the slide-and-Romey part of the thing to a half hour and agreed that I would just *stop* then, freeing the rest of the group for more talk and group-sharing. I agreed not to make any further input during that half hour except as direct response to things addressed to me. Usually we continued until well beyond the normal end of the period, and some people (different ones at different times) would stay on for an hour or more after scheduled closing time. At other times when no one had anything to say, we would sit together quietly for a few minutes, and then people would drift off on their own.

I am getting more and more comfortable with the idea that, if I don't have anything to say, I'll just admit it and not feel compelled to lecture just because it's 10:10 A.M. Wednesday.

Recently, I have listed all credit activities related to beginning experiences on a "to-be-arranged" basis. For upper level work I have agreed to be present in a certain room at a certain time, three times a week - but there is no course number or credit attached to that time. All of the "credit" is through arranged "special problems" unrelated as far as the registrar is concerned to my presence in that room, where I will work with learners interested in minerology and petrology. I still want to give some talks both for beginning learners and for the advanced groups but I have decided to schedule all of them as public lectures and demonstrations, rather than as "course-related" lectures. Each will be topical and a one-time affair. (I really am not limiting myself: if I decide to do a series of talks on a topic I will do that, too.) None will be formally related to "credit," but anyone can consider participation in any of these as part of his "credit" if he wishes to. These talks are scheduled for evening or late afternoon presentation, and we are recording some of them and placing them on a "dial access" telephone system that allows people to dial any one of over 100 stored lectures at any time of the day or night. Sometimes a good crowd shows up. At other times there are only a few of us. We have to compete with other talks, social events, and all sorts of outside factors. But the ones who come make a definite commitment.

As we are trying to set things up in our group, any person at any level can schedule a talk at any time. All a person need do is hang a card on one of several announcement boards. We are finding an increasing number of people beginning to schedule talks on their work, trips, etc. Some of these occur in conjunction with science club activities. Others are simply put up for any appropriate time. Any talk which gets and holds a voluntary audience must be useful input. The test of usefulness is in *complete* optionality!

* * *

Another means of presenting ideas to a group is through a "Buberian Dialog" after the philosopher Martin Buber. People with opposing views on a subject are invited to present and discuss their views in front of a group. A ground rule states that no one is allowed to argue with anyone else on the panel. Discussants may seek clarification and areas of common agreement, but they must accept any viewpoint presented by another panelist without contradicting or arguing. Several of our faculty members with strongly opposing views on grading recently conducted a Buberian Dialog on grading in front of about 75 people from our school. Afterwards, we opened the discussion to the public, with the same ground rules: no arguments, only clarification. This dialog helped us understand each others' points of view. In a Buberian Dialog, everybody wins, and the negative, competitive aspects of formal debate are minimized.

FILMS

Films should be for consumption by the general public. We have set up a "science cinema" with several showings on a given weekday. When we obtain films on rental we try to have extra showings, as well-publicized as possible to assure that we are getting our money's worth. In this way, we have available on the order of thirty films per term. Usually, we allow time for a discussion session at the end of these films, permitting further exploration of the subject at hand by the group. When any one of us in the group wishes to do so, we may schedule talks or lab ideas related to or supplemented by the film.

In many terms we have more than one series going: one term it was a general earth science series for two main public showings per week and an oceanography series with one main public showing per week. In another term we had a special series of metereology films as well. A group of students ordered their own astronomy films one year. We now have a large environmental studies program featuring a film or two a week.

With the recent advances in communications technology we are now able to videotape certain T.V. programs. We are recording the Bronowski: *Ascent of Man* series, the NSF *Nova* series, *National Geographic Society* programs and various "specials" for re-showing on a regularly scheduled basis.

During the original showings of some of these on T.V., we have open house, which gives people a chance to join in our home settings.

DEMONSTRATIONS

In open environments for learning science, demonstrations are an important kind of input. Equipment of all sorts is available for anyone to use and yet some of it is delicate. There may also be some tricks of use that can be transmitted through demonstration.

A danger of a demonstration is that people may get the notion that there is a single way to do whatever the demonstrator does, and that everyone else should do it that way. People can interpret the demonstration that way even if they are told that there are no "strict" rules. I see people copying down "my recipe" for using a piece of equipment or for setting up an experimental procedure. I am aware that I sometimes slavishly and mindlessly follow someone else's procedure without being willing to modify and test the modification. When I do this, it means that I do not understand the nature of the procedure I am attempting. Thus a demonstrator ought to provide elaborate cautions against doing it "his way." People should be encouraged to try new procedures and to find new applications for instruments.

At the same time, a demonstrator may know from technical specifications of instruments that if you turn knob A beyond point Z a $100.00 repair bill will follow. So a demonstration of equipment must necessarily include some comments on safety, maintenence, and potential dangers to people and to equipment.

Many demonstrations of this type can be programmed. We ask people to be *checked out* before they use any major pieces of equipment. Bob Lepper tells of a person who approached him and asked for the key to the x-ray room. Bob said, "Are you ready to tell me something about how the machine works and what it can do first?" When the learner answered negatively, Bob told him to come back later when he could do so. The next week, he came back and they began a dialogue on some things he had read. Bob said, "O.K., now go read more and come back later." After about three meetings like this, Bob felt that a sufficient "check-out" had been conducted, and he made the key available.

We have lists of all of our people who are checked out to use various equipment and spaces. Anyone can request a demonstration and be checked out by any one of a number of people. He can seek out a friend who is on the list of people who are checked out, as well as hunting down a faculty person.

Barb Bates noticed that lots of people who were giving talks on their work and writing papers to be shown around or distributed were doing low-quality graphs and figures. She also noticed that a lot of departmental drafting equipment was not being kept in good condition. So she scheduled demonstrations on drafting techniques, at which she is especially adept. A number of people attended, and their work will look better now as a result of their attendance at an optional demonstration of this type. Dale Chayes, Dave Tewkesbury and Larry Huppert have done the same thing with our darkroom facilities several times. Tom Shaver took responsibility for the lapidary equipment. We still have problems because we don't control the check-out system tightly, but a spirit of wanting to take care of materials and equipment and to use them well is beginning to grow.

Other demonstrations can serve strictly as stimulators. Earlier I mentioned a way of demonstrating crystal growth in a way that I thought was exciting. Then I got hung up on the feeling that every student should do this experiment in a "hands-on" fashion. So I put it into a lab manual so everyone would have to do it. I also managed to slide it into the ESCP earth science course as a recommended exercise. After watching how many learners really aren't interested in the hands-on approach, but enjoy the demonstration, I expect again to set up an optional, public, demonstration-discussion session on crystal growth. So I have passed through stages: demonstration with more or less required attendance required laboratory exercise totally public demonstration with suggestions for further involvement for those who wish to pursue it, with full access to appropriate laboratory set-ups in the learning center.

For a while I rejected the "Mr. Wizzard" approach to demonstrating scientific notions. Now I believe that such approaches have their

place as input points in the learning environment, as long as they are optional. I prefer to make such sessions into vehicles for discussion, although I also accept that pure "magic shows" thought of as being intended mainly for entertainment can provide important access routes to creative and functional science-oriented activities.

[illegible]

Groups can provide important input points. I suspect that in the long run groups may be of as much or more value than any other input in the learning environment.

E. T. Hall, in *The Hidden Dimension*, says the following about needs that animals, including humans, have as far as groups and other animals are concerned:

> *"Social animals need to stay in touch with each other. Loss of contact with the group can be fatal for a variety of reasons including exposure to predators. Social distance is not simply the distance at which an animal will lose contact with the group - that is, the distance at which it can no longer see, hear, or smell the group - it is rather a psychological distance, one at which the animal apparently begins to feel anxious when he exceeds its limits. We can think of it as a hidden bond that* contains *the group."*

In open education there has been a tendency by some people to avoid groups. Even in some of the more "conventional" educational environments (fixed curriculum and more or less fixed time schedules) where "individualized instruction" has been picked up as a banner, the trend has been to get *out of* groups.

The reason for this movement away from groups seems clear. Groups in the school systems have always meant *required* groups and have generally coincided with the conventional concept of classes. Amazingly enough, in some conventional but "individualized" systems, teachers have noted the need for group meetings to "humanize" the system and get people back together at least occasionally. Unfortunately, the only kinds of groups they seem to know about are class-type groups, however, so these have in general produced little that is useful. "Group" to most educators and students means people sitting in rows, looking at the backs of each others' heads, listening to a group-leader "lead" the discussion, and scootching down in your seat in the hope you won't be called on! In some of the more "advanced" schools a group now means sitting in a circle. As one person said at a recent meeting, "The only thing that I find more uncomfortable than sitting in rows looking toward the front of the room is being forced to sit in a circle where there is no place to hide!" Group is thus equated by many learners as an unpleasant and formal device for coercion whether it is called a "class," a "seminar," or a "discussion group."

Several kinds of group activities warrant special mention. No clear limits separate these from each other. They all flow into each other and each may contain elements of the others. For convenience the discussion will center on encounter-type groups, gestalt-type groups, minicourse groups, creativity groups, and others that may come to mind.

At the Earth Science Teacher Preparation Project we moved away from group presentations (= classes) to organized, small-group activities (= discussion groups). Then we went to meetings with no externally imposed structure in which the group was asked to set up its own organizational pattern. Ultimately we evolved into a pattern of leaderless groups. Some psychologists finally told us that we were really doing encounter-type groups. At that time, we didn't know about "formal" encounter groups. Carl Rogers' approach to groups came to our attention. Rogers has published one of the best accounts of his operating philosophy in a book entitled *Carl Rogers on Encounter Groups*. Unfortunately the label "encounter group" has now received connotations that have little to do with Rogerian basic encounter groups. So I find myself avoiding that label and just speaking of "groups."

I have seen many groups of the encounter type in educational situations over the past six years. This kind of format has a great deal to offer in the learning environment. A principal function is to allow the expression of deeper feelings of members of the group about the things they are involved in. The group is concerned with development of relationships among members of the group and also with the growth of each person as an individual. Basic encounter groups are commonly held over periods of several days and involve people who are strangers, and do not work together. In these, the goal is personal growth of the individuals and helping them to realize that other people care about them. After the meeting, the members may part and not see each other again. Many very personal things can be exposed without any thought that information may be used against a group member in some later context.

In most school environments we are working with what can be considered "family" groups. The members may be more hesitant to work through deeply personal problems. People in such groups will be seeing each other again and again and will have occasion to work together, share facilities, and support each other on a regular basis. In order for people's energy to be directed toward positive growth and learning rather than to conflict, argumentation, and strife, supportive group meetings can provide a place for low-threat expression of deeper feelings about many personal fears, relationships, and problems. Rogerian group approaches were first developed in connection with psychotherapy. They are intended to have a "therapeutic" effect in learning environments occupied by "normal" people as well. In our society, most students have genuine learning disabilities to overcome, especially the inability to be self-directed and to learn effectively on their own. These learning disabilities are equally as disabling as dyslexia or other perceptual "disabilities" considered to be "acute" organic problems.

Jack, a junior high school science teacher, decided to try encounter-type activities with some of his science classes. He used the approaches described by Willian C. Glasser in *Schools Without Failure*. A fundamental problem Jack had to deal with was that he had a required audience. Students were *scheduled* to be in his room at that time and neither he nor they had any control over this. On days when there was to be a "group," the boys would shove the tables out of the way and set the chairs up in a large circle. (Glasser has a big thing about circles!) One such meeting included Jack, the class, the school counselor (a young woman with experience in use of group-process techniques) and the local superintendant of schools and me. The group meeting was what can be called a "task-oriented" one. In addition to general expressions of feelings there were definite problems of disruptiveness on the part of some group members, and these were aired. Jack held these groups regularly, and he felt that they were helping in solving some of the problems the group was having in implementing student-centered classroom approaches. The main problems Jack and his group faced were that the meetings were not optional and their whole participation in the regular science-oriented sessions was not either. Forced attendance may set up barriers that are impossible to get over.

In numerous workshops held by ESTPP we chose encounter formats. Here, participation was optional, but at first the options turned out to be "in or out." You could either be in the group or else go off somewhere by yourself. Because people had come long distances, most participated, but some approached this kind of meeting with hostility. Many overcame their hostility and profited from their participation. Later, we set up more definite kinds of alternative possibilities and the encounter activities were more functionally optional. They also produced better "results" in terms of personal growth and problem-solving as shown by later communications from the participants.

In our geology and geography group at St. Lawrence University we have tried to introduce group activities of this type in various ways. Generally, positive results are obtained when we go off to a retreat center for a couple of days and go into residence together. At the beginning of our attempts to set up a confluent, open environment we took our faculty and fifty upper-level students to a retreat in the Adirondack Mountains. Besides a good deal of playing together to overcome personal barriers between students and students, faculty and students, and faculty and faculty, we also had several sessions in which we aimed at an approxima-

tion of encounter. At one large session we conducted a "fish bowl." Faculty members sat in a circle surrounded by a larger circle of students. We talked about our fears and apprehensions as openly as possible and tried really to listen to each other. An open chair in our circle invited others to join our circle to bring forth their own concerns. Many students did come into the circle to present feelings. We also ate one meal without utensils. By getting our fingers into the food we got around some usually limiting social conventions and freed ourselves to talk more informally. People who chose not to participate in that particular game sat at another table, and both groups seemed acceptant of each other.

A later meeting of this type, five months later, provided an even better environment for sharing. Some members of the group, however, also rejected the format completely and stopped participating in these groups. For those who continued, the groups provided an excellent place for support and growth. To some extent the participation of some and non-participation of others led to divergence that would perhaps have been better accommodated if the two groups could have set up completely separate working arrangements back at school. A risk in using encounter formats is that they induce honest confrontation. A possible outcome is the recognition that segments of a larger group will not work together well and should be separated.

As far as that department as a whole is concerned, we have now ceased having "departmental" retreats because of the splits they seemed to be fostering. Organizationally, we still are bound together. So we needed to seek ways of bringing ourselves together into a satisfactory working arrangement. Much group activity continues, but it is no longer "departmental." For us, in a field-related science, we are able to combine elements of "encounter" with normal field-trip activity. The words "encounter" and "group" seem worrysome to some people.

Gunner and Fritz have regular two and one-half day groups for people in guidance counselling and teacher education programs. These purely optional groups are truly supportive of each individual. There is no manipulation of any kind allowed. Whenever a member of the group tries to force another member to react or participate, the leaders react against the attempt. The only real rule is, indeed, that each person decides the terms of his or her own participation. Occasionally the leaders "check in" on someone who has been quiet. "I just found myself wondering if you had anything you wanted to say." Pre-service teachers seem to go away with a strong new sense of self and of the extent to which several human beings, throwing aside their facades and status as much as possible for them at the moment, can form a mutually supportive group.

To me that's what has to occur to make a learning environment really functional. I can work by myself and learn by myself and grow. I can become more independent and more self-actualizing. But I am poor to the extent that I cannot learn from others and work in groups. I am a social animal. I can choose to be stubbornly independent at all costs and I can spend my energy and time competing. Or I can increase the richness of my knowing and being by a deep sharing in which I help others and accept help from them while maintaining a feeling of freedom and independence. I feel I can learn more and grow more in this kind of situation.

During one term, I suggested that each of two groups get together once a week for any kind of sharing they wished to engage in. Both groups were interested in learning activities related to the earth in some way. At each group we sat around informally and if someone had something to say, he or she said it. If the silence got too long or painful I would express my feeling of this. Finally we would break up. Although each group had about thirty people in it, the attendance at these sessions rarely exceeded half, and some of the people we scarcely saw at all. They all knew that their primary work was to be independent and that, regardless of how I felt about it, I wouldn't use any coercive way of forcing them to attend the group meetings. Mainly I was disappointed that all of these people doing exciting work were not in touch with each other and didn't seem to care about each other. In their independence, they were losing sight of the richness they could offer each other. The power of the group was not being used.

I expressed my disappointment in a number of notes and letters during the term. Still, some people failed altogether to attend, and many came only sporadically. Something else was always more important since this meeting was not required. In a kind of desperation I set up a couple of final meetings to be held at my house during the last week of the term.

To my astonishment, nearly the whole group showed up at one or the other or both of our sessions. A few people wanted to report to the whole group about their work, but most simply shared eagerly with each other on a one-to-one basis.

I still feel dissatisfied with the lack of a greater commitment to the group. All of those good people, and they didn't discover each other until the *end* of their experience. That's not quite right, though, for many smaller groups within the group did form and work together throughout the term, and yet each person maintained individual involvement and interest. And, wait a minute! They *did,* for the most part, discover each other! Even if it was on the last day! That's what education is supposed to be about, isn't it? *Beginnings!*

So, I guess it may have been good. I still suffer from the teacher's misapprehension that if I don't know about it, it can't be going on! That's a hang-up I'm working on.

The next year I set up three different kinds of groups to see how they would work. The first of these I titled "Geology for Science Haters." We began this group of fifteen people with a two-day organizational "encounter group." This involved eating together, playing together, spreading out our sleeping bags on the floor together, sitting in front of the fire together, talking together, and even, as John Carpenter once put it about this kind of meeting, "looking at some stones." My goal was to create a supportive environment in which people could come to know and value each other and develop a basis for confluent learning. Lucretia brought soapstone, which a number of people carved - another access route into the study of the earth in a hands-on way of working with earth materials of esthetic and tactile interest. The group did not choose to sit down as a group - except to play some games in the evenings - until just before our departure. One person volunteered that, "I've come to know this whole group better in the first meeting of the term than I have ever known even individuals in other 'classes' after a whole term." The feeling seemed to be shared. We seemed to develop a sense of having accepted each other as people and "knowing" each other as humans even though we didn't know much about each other in terms of personal histories and interests. But now, my question was, to what further activities could all of this lead if we hoped to be a continuing group using our newly discovered power to commit ourselves to learning together?

Attendance at the first couple of meetings after the week-end was pretty good, but people seemed to want me to tell them what to do. (What had become of their ability to find worthwhile directions for their learning? How was the "in-school" environment inhibiting this?) Their attendance began to fall off. We rarely had more than half of the group there, and little outside activity in our chosen area of interest provided a basis for discussion, questioning, or sharing. Individuals did get involved in some project-related activity, but people seemed unwilling to share or work together. I was about to give the group up for lost, as a group, even though I had lots of good personal things going with several individuals and sub-groups. Then, suddenly, near the end of the term, the group spontaneously organized a second week-end encounter at the same lodge we had met in earlier. Nearly everyone was present, and there was a close feeling of sharing, belonging and valuing each others' work. As I write this two years later I realize from subsequent activities of the group members that many of them *did* draw strength from the group and that it did work. Many group members had to deal with personal issues of maturation and growth that transcended the geology part. And yet several have now gone on to major in geology, too. It is important not to expect too much in fifteen weeks! If beginnings occur this is what is most important.

I labelled a second group, "Introductory Geology Research Seminar." We met one long afternoon each week. For the first several weeks, we took a field trip each afternoon. Later, when bad weather struck, we had indoor, seminar-type meetings. Attendance was almost perfect and each person seemed to be an energy-generator. We made no special attempts at "encounter-type" meetings. No conscious attempts to deal directly with integration of emotions and cognitive factors. Somehow, everything seemed integrated and the "class chemistry" was good. The group in which we didn't do any manipulating seemed to "work" better than the one in which we used personal interaction "gimmicks." Or did it, really? The two groups were very different in make-up, and the initial self-selection into "science-haters" and "science-lovers" may have been the more important variable. That's one big trouble; when a group "works," it is nearly impossible to find out how and why. The whole defies analysis through examination of the parts. There can be no formula.

A third group of thirty people signed up under a bunch of different "special projects" credit numbers. All expressed a desire to learn about mineralogy and petrology (rocks). People at levels from beginners to advanced students entered the group, each with a different orientation, interests, and advance preparation. The larger group turned out not to have much special significance, but I hoped that all thirty of the participants could get to know each other early in the term as a basic resource group of potentially supportive workers. Several different kinds of sub-groups formed and several short topical mini-courses developed. A lack of group focus and unwillingness of members to commit time to each other remained problems.

Encounter formats seem most helpful when they are not pushed or contrived. Most importantly, I am learning the importance of not expecting too much, and especially, of not expecting any group to be *like* any other group. As "leader" I often have felt a burden to "manage" the group, to create conditions that will make it "work." One thing a leader has to learn is to let the group go its own way. His function is to listen, respond, and express his own feelings openly but not in such a way as to push or force the group. It's the difference between, "I feel very uncomfortable with the lack of willingness to share here" and "Come one, you people, you're supposed to be sharing; now do so or else!" In the long run I want to see honesty and openness as a pervasive, everyday element in the learning environment. Groups may sometimes help in the long process of reaching this goal. I should emphasize, too, that this is a *process* goal. As such, you never really "get there." It "works" for a while, but you don't just *create* it. Maintenance of a supportive environment for personal, emotional, and cognitive growth requires continuing energy, vitality, and concern.

MINI-COURSES

Topically oriented short-courses to which smaller or larger groups of people commit themselves can greatly enrich the overall educational environment. One kind of short-course that has been used to great advantage is the intense two-day to one-week course where all of the participants do nothing but work together on a single area of interest. This format is much used by professionals, but, regretably, it has not found its way much into schools. At the professional level, the AAAS has imitated a group of "Chautauquas" in which a "course" travels around from one place to another. New people in each area participate intensely for several days. The Gordon Conferences held during the summer time on the campuses of several northeastern U. S. colleges, private secondary schools and academies provide environments where new ideas are generated as specialists and interested non-specialists reside together for several days of intense study and discussion. A number of special short courses conducted by the American Geological Institute were not only of benefit to large numbers of established professionals desiring to up-date themselves, but also to graduate-student participants. Booklets and guides from these have left permanent records of these short courses and have provided learning resources for further group and individual activity. In the earth sciences and in field biology, extended field trips provide similar "short course" types of activity.

In order to realize the potential of mini-course and short-course activities it becomes necessary to challenge the rigid term structures of today's schools. Mini-courses and other short-courses should be highly flexible as to duration and intensity. Study groups that meet occasionally over several weeks fill the needs in some instances. In others a highly intense, residential effort may be best. Some activities lend themselves well to being done together with a number of very different kinds of activities. Others demand total involvement for a short while. Administrative arrangements such as "flexible terming" become desirable. It is possible to combine a bunch of mini-courses to fit into the time normally allocated to regular, full terms. We tried this at Syracuse and similar efforts are coming into vogue in a number of schools at various levels (University of South Carolina, Ohio University, etc.). "Mini-course" is another "in" word. Unfortunately, confining the concept to the old framework emasculates it in the long run and the same old rigidity emerges with only a slight change in clothing.

"Flexible terming" is a phrase I now favor for an organizational pattern in which group or individual activities begin whenever a group or individual wishes and end when the group or individual has finished. If credit is involved it can be negotiated *after* the experience on the basis of time spent, product developed, or skills obtained. It breaks totally out of the concept of term-long courses. A "course," individual or group, can begin and end on its own schedule and may then be developed as a total-immersion kind of involvement, undisturbed by competing involvements. "Courses" in a *flexible terming* system can then be done singly (total involvement) or several jointly depending on the needs and desires of the people involved and the nature of the subject matter. This recognizes that people sometimes desire to have several involvements going on simultaneously over longer periods, and at other times they desire intense and focussed activity in a single area for shorter times.

Several K-12 open schools accomplish these goals through a system called *flexible daily scheduling*. In these, a new schedule is posted each day based upon the wishes of individual teachers and students. Given "courses" generally last only a few weeks, and the subject matter covered is less extended than in a full-term course. Longer courses are modularized just as textbooks are, in many areas of interest, being replaced by shorter, topically organized pamphlets.

We need to "play" with the time organization of schools in order to accommodate the needs of various teachers, students, and blocks of subject matter.

SINGLE-COURSE TERMS

A problem that has frustrated me perhaps more than any other is that of several competing "courses" all running at once. As I implement an open environment based on confluence and personal responsibility, I cease requiring students to attend. I stop pushing them. However, when they are involved at the same time in several other activities where there *is* pressure, they feel incredible competition for time among their subjects. Even though a student may want to take three days off for a field trip or to come to a special event, he or she will most often stay home to do a dull lesson for another class or study for a test rather than taking the more attractive path. The quality of the learning is lower in all areas than it needs to be, as a result of this competition. As the student studies or writes his essay he spends part of his time wishing he were on the field trip. Energy is wasted and the quality of the study is reduced. (The same thing is true for people forced to go on a field trip or required to go see a play for an English class when they might prefer to do a math lesson that they particularly enjoy! Students have told me this, which is one of the reasons I stopped requiring *my* pet activity: field trips.)

Many colleges have introduced an "interterm," "interim" or "January Term" program to provide a time for a more unified experience not troubled by competition among subjects. Some of my own best experiences have recently happened in our interterm. Groups of us are able to devote ourselves completely to a common set of goals, undisturbed by outside "re-

quirements." Of course there are other kinds of competition for time. Many personal factors continue to compete. Maybe a person preferred to sleep late rather than go to a seminar. Perhaps a date or a weekend off campus took priority. Nonetheless, I have felt a greater flow of positive energy and fewer competitive pressures under a single-subject schedule. Frequently, the products I see are of higher quality, too. I attribute this to the more integrated feelings people have. There are fewer emotional blocks in the way. In my own, open, environment, people can really give themselves to what they want to do.

At Colorado College, nine 3-and-a-half week terms comprise the academic year. After several trial years, they have now voted to continue this system by an 80% plurality. Each term provides the possibility of a single absorbing and intense involvement. Teachers and students really come to know each other. The number of failing grades has diminished to almost zero. Failure usually happens when a teacher with heavy expectations and a student who rejects or doesn't understand these expectations lose touch. When each teacher has only a relatively small number of students (the true student:teacher ratio being more nearly actualized) it is difficult for them *not* to realize when someone is in distress and begin to negotiate. The chances of creating a confluent environment are proportional to the amount of *effective contact* that can occur between teacher and student and student and student.

Such single-involvement activities, too, can be overdone. Getting locked into any system may be nearly as bad as getting locked into any other. Inflexibility is the real villain in the piece. Some teachers, students, and subject matters may need to be grouped and integrated. The important thing is to structure programs so as to reduce internal competition among the elements of the program. Such internal competition can only lead to energy drain and to negative attitudes and behavior patterns.

"Block" programs provide another mechanism for reducing competition between activities. In our teacher-education program we have a "professional semester" in which student teachers devote themselves completely to an internship in the schools where they practice teach. Their education "courses" are specially scheduled in blocks so as not to interfere with the internship, which is seen by all as having primary importance. This plan has become common in many teacher-training programs.

In the geology and geography department I work in, I urge students to take at least one term in which all of their courses are in our department. We exercise a more flexible kind of scheduling than many departments, and students can thus concentrate their activity more effectively. (However, even in our "flexible" group there is movement back toward a conventional Monday-Wednesday-Friday-9:00 AM schedule. This may soon destroy the flexibility I thought we had established for ourselves. We continue to let tradition be our own worst enemy.)

During a recent summer session we created a flexibly-scheduled "field school." Those who were fully committed to this program had the possibility of spontaneously doing something very different from one day to the next. People who had set up competing programs within other areas felt trapped and often missed attractive parts of our program. Even those within the program still made choices that they later considered to be poor ones, but at least they felt that they were in control of their own lives. The Coleman report indicated strongly that learners who functioned best and most positively were those who had come to feel that they did have a substantial measure of control over their own lives.

A CONCLUDING NOTE ABOUT GROUPS IN GENERAL, AND SOME CAUTIONS

Groups are important to me. In the right kinds of groups all of us can learn a great deal - probably more than we can by ourselves. At the same time I want to avoid dependence on groups. Generally, groups will happen when they are ready to. There is a natural tendency for most people to seek groups as they participate in their various "social atoms" as J. L. Moreno and other sociometrists have amply demonstrated. However, I can do certain things that may facilitate their formation. I can also help people to become more aware of the incipient groups I detect and I may be able to help in the restructuring of groups so that their members can work together more profitably and can help their memberships to include more compatible co-workers. People with vastly different needs, styles, and approaches sometimes are more or less forced together into groups, with disruptive results. Formation of multiple groups can help resolve such problems, and I can use my awareness to help call attention to such problems. Sometimes it is as important or even more important to "ungroup" as it is to group!

I can help groups to form by providing many opportunities for people to be together in many different contexts. Once I have provided the chance, however, all I can do is let the situation flow and continue to provide more opportunities. I can also participate actively in groups that specially interest me. If I worry about why the groups aren't meeting as I hoped they would, I waste energy. I prefer to use my energy to keep the new opportunities coming rather than analyzing the old ones and fretting about the past. I also waste energy if I spend time congratulating myself on having "created" a successful group. That's nonsense, because the group creates itself and I wish to claim no credit for it. A good group makes me feel good. But let me bask in the good feeling just enough to move into the next opportunities for new groups with high good spirit and great energy. *Expectation* that a group will work leads to bad feelings and downfall. Hope is OK, I think, as long as I don't allow myself to be let down

too much if a group fails to materialize. Every time a new idea for a new type of group or "exercise" comes up, I can try it again and again. There is no such thing as failure of a "type" of group. There is only failure of the *group process* to materialize in a given group of people in a rewarding way. This means we can try again in another context, with different people. I hope that my own sensitivity to the group process continues to grow. The only way it can is for me to keep trying and to keep accepting that some groups don't work. The failure of a group to materialize may also lead to growth of learners. The process of group formation and dissipation is as much an essential part of the overall group process as what goes on during the functioning of the group.

A danger in groups is that even a very positive-seeming group may begin to exclude people, to become closed. On a raft trip down the Green River in Utah, thirty of us, mainly junior high school science teachers, lived together and experienced a range of joys, risks, lovings, hatings together. We became very close during a two-week workshop that included this and other experiences. Upon our return to the Denver area, where we were all involved in school work, several other people joined our group for a program of academic-year activities. These people were never fully admitted to the group and the group as a whole seemed to reject awareness of this even though we, as leaders, kept introducing the idea in other work groups and encounter-type sessions. The initial group had, to at least some degree, set up walls around itself.

The members of our geology and geography community at St. Lawrence tend to make themselves into a little island where mutual dependencies are set up and newcomers may feel excluded. We are working toward awareness of the problems of in-groups and out-groups.

One exercise I have seen groups try in dealing with the problem of in-groups is to ask several people to form a group. Others are instructed to watch; yet others are instructed to leave the room until called back. The people in the group are instructed to form a circle and to resist any attempts by an outsider to enter the circle. They are to ignore the person completely except to exclude him or her in any physical way they choose. One of the people waiting outside the room is then called in and told to try to enter the group using any means he or she chooses. I have seen outsiders ask politely, beg, gently touch people in the circle and even actively fight to gain entry. One man, chairman of a science department in a major university, became almost frantic to obtain admission, and the group held together so firmly that we feared that someone might actually be injured in the fray. Others were actually finally admitted, in spite of the "rules", because someone in the circle was so touched by the realness of the anguish the outsider showed about his exclusion. The exercise ends with the group then sharing their feelings experienced during the activity. Tremendously strong emotions of many sorts - hate, love, fear, hesitancy, desire, determination, anguish, disappointment, loneliness - are felt. The nature of the group as a tightly closed box that can produce strong emotional problems becomes clear.

In ESEP we found ourselves split into subgroups that came into frequent conflict. We became aware of the problem, but we never did solve the problem very effectively. Group conflict led to expenditure of energy that at times inhibited our ability to work together toward strong common goals.

Each of us attaches himself to various groups in various contexts. Sometimes we exclude people. Recognition of these group phenomena and working with them rather than against them is a fundamental need in any function involving more than one person. We need to become more and more aware of when a group is facilitative, when it inhibits, when it is open, flowing, flexible, and responsive. When a group becomes inhibitory people are needed who can confront the members of the group with their perception. Through constant confrontation and working problems through, we can make conscious choices and decisions about whom we want to work with, where and for how long. If we, as individuals, allow a group to control us rather than controlling our own relationships with the groups, we lose an important piece of our own selves, and the environment for learning is bound to diminish in quality.

I have heard people refer to a phenomenon known as the "tyranny of the group." Golding's *The Lord of the Flies* describes a group-tyranny situation. Whenever people feel forced into personal disclosures or actions that they later regret and would not normally have participated in, they are declining to take personal responsibility and are allowing themselves to be dominated by the group. Each person can avoid this trap for himself, but I feel it is essential for both facilitators of learning and for learners themselves to watch out for this kind of tyranny. It can usually be defused if it gets started, providing a few people are sensitive enough to recognize it and to confront the group with their perception of its occurrence.

FIELD EXPERIENCES

One of my favorite activities has long been to take people on field trips. Travelling together away from the school brings us all together in a gestalt where small-talk, personal matters, emotions, cognition can all join freely. We have a better chance of getting really to know each other, it seems, when we get away from school buildings, when we move outward and recognize the world as our school.

In *Inquiry Techniques for Teaching Science* I warned against guided tours in which teachers just took students around and showed them things, lecturing all the while. These, I suggested, would lead to passive inactivity rather than to a more open kind of exploration and growth of perceptions. I felt at that time that teachers should not lead their students around in a controlled fashion. Rather, they should turn the students loose with carefully assigned problems to focus on but should expect the students to find their own routes to solving these. Alternatively they might use a form of "guided inquiry."

The guided-inquiry trip I favored at that time has many perils attached to it. On this kind of trip, the teacher takes his or her students to a place, poses a problem, and then quizzes the students along an "inquiry" path until the student comes up with the answer the teacher expected. This is a "Socratic" teaching technique by which the teacher leads the student to a pre-planned conclusion. The teacher asks questions not to *find out*, but to *show* the student *how* he should think. As if there were a single channel or a few channels by which we can arrive at "truth."

I now feel that there is no real "truth" in natural and social situations - only different ways of perceiving. Thus I now find this an unproductive way of trying to facilitate learning. Rather than helping the student to develop new perceptions and find more personal and open ways of viewing the natural and social world, this convinces him that he needs a guide in order to find answers that have an objective reality of their own. In my view, "answers" in nature are as much "subjective" and within the mind of the person as they are "objective." The dichotomy often observed between "subjective" and "objective" factors limits and inhibits perception, understanding, and the discovery of meaning rather than enhancing it.

Guided-inquiry field trips also can lead to fear, uncertainty, discontent, and loss of self-confidence and curiosity in students. The teacher is perceived as powerful and wise, and students are supposed to guess, through a somewhat formalized set of questions, what the teacher has in mind as an answer or set of answers. "Rightness," "wrongness," or at least "level of appropriateness" must be established for each link of the students' chain of reasoning.

In field geology courses I took in graduate school, my instructors led a group of 15 of us from one place to another, each place chosen because it showed some kind of critical relationship in the explanation we were expected to replicate. At each location, we would huddle around the rock outcropping. Each of us would hurry to grab a small piece of rock, and we would begin to study it with the assistance of our magnifying lenses. The geometry of these groups was interesting. The instructor would frequently stand in the middle of the group. We would all face *outward*, away from him, in hopes that he would not "see" or question us. Each of us hid behind his rock sample and hand lens! Then the instructor would launch the dreaded questions. It was socratic and very uncomfortable for us. Mainly we feared to ask our own questions, to satisfy our own curiosity, worried that we might receive black marks in the instructor's mental grade book. At times, he passed out little slips of paper and gave us a spot quiz: "What feature are we now standing on?"

We learned a lot of conventional geology this way, far more than we could ever have learned in any classroom setting. But we were also being programmed to see what had already been seen, and in the way in which other people had seen it. We were not learning to be open to the world around us, in which there are no rights and wrongs except as we define them *by convention*.

When Dinko was working recently with an eighth-grade class, he led them carefully through a socratic, guided inquiry. Finally, an older student in the group, who felt comfortable with Dinko, said, "Look, if you want us just to know that, why don't you just *tell* us so that we can save five minutes on each of these 'facts' of yours!"

Guided tours and guided inquiry may not be of very great use and trips in which students are substantially involved on their own terms are more likely to be profitable. My viewpoint changes in many respects when I stop trying to manage people to see what I want them to see. When I move to the idea of optionality of field trips, that continues to change my attitude toward field activities.

When I began working with people learning science I thought that field work, involvement with the *real* world, out there, was the most important thing of all. Then I found out that lots of students would only go on trips and do field activities if I compelled them to. So I compelled them. I said, "I don't care what else you do in here, but I want you to do all of the lab work and go on all of the field trips." Missing a trip was getting an incomplete or even failing the course. But that wasn't much fun. Suddenly I had pangs of doubt: "OK, *you* think it's important, Romey, but how about them? If they get turned off by it, what's the use?"

So now, after several transitional stages, I've moved to totally optional trips. Sometimes only a handful of people show up. But the group moves, cares, works. At first it

was disappointing, because I thought people should turn out in droves. Then I found that if I scheduled lots of trips, often short ones, different people would come. Word started to get around that the involvement might be worthwhile and fun. Another thing became apparent: I didn't have to be along in order for people to learn things. Now we seem to have a lot of knock-together, spur-of-the-moment trips where a bunch of people will just load up in a car, grab some bicycles, or even walk off for a field activity.

Publicity becomes a problem sometimes. Tom had scheduled an afternoon field trip and no one showed up. He really wanted to take some people out to share his excitement. So he went to the snack bar and "kidnapped" a half dozen people. They had a delightfully productive afternoon. Energy breeds energy. In an alternative scenario an instructor goes on a previously "advertised" field trip when he's not really in the mood at all. Unless he can be very open to what goes on, his low energy and negativity can spread and diminish the value of the trip.

In that section from *Inquiry Techniques* I also talked about focusing people, getting them to see what *I* knew to be important in the given locality. Just as I was finishing reading proof on the final pages of *Inquiry Techniques* in 1968 I began to question the wisdom in that. I went out on a field trip to *observe* how an earth science (they called it "geography" there) teacher in one of the big Oslo, Norway, high schools worked with his group. I was curious how much of an inquiry approach he would use. Together we walked up Kolsås Hill, through a group of sedimentary rocks and lava flows, a superb exposure of rocks, and with a fantastic overview from the top. The teacher stopped at each locality he thought was important. A few students would stop with him. Others paid no attention, going off in their own directions. My first thoughts were that the trip was a failure. But as I considered the experience I remembered the good feeling of the group. Those who wanted to do the teacher's kind of geology had a chance to do so and to ask all of the quesitons they wanted to. Those who didn't couldn't help absorbing a lot just by being along. All left with a positive *attitude*. Furthermore, a good published field-trip guide exists and any person will be able to return with the guide at any time to look over the section again, as I myself have done several times since then both alone and with others. An enemy of mine and of many teachers is my own tendency to expect too much, to expect a finished product rather than to accept the growth of an attitude and the *beginning* of a process.

Later, I accompanied other secondary school groups on field trips and became more and more aware that the less teachers structured their trips the more students seemed to *look* and to see on their own. Sometimes they looked at what might have been thought of as the "wrong" things. Debbie, a girl I worked with on several field trips, was always dragging up pebbles and bringing these over to show people, to ask about, or talk about. As far as I was concerned, the trips were *supposed* to be concerned with bedrock - the rock that was in place at the localities - rather than with gravels, soils, etc. I always kidded her with comments like "Do you think that one (a glacially transported boulder) *really* lived around here?" I can remember that my voice carried a slightly sarcastic note and probably conveyed the idea, "You dope!" After a number of trips, I saw her coming up to me with another of her famous boulders. "What do you think...?, - No, that's not what's supposed to be interesting here." I had successfully conditioned her to begin seeing things my way. Her interest and observations were equally as valid as mine, just different, but mine seem to have prevailed. She learned that she should see through my eyes. She should please me.

On a more recent occasion, a geology major in our group invited me to come see something he had thought especially exciting - some fossiliferous rocks along the St. Lawrence River. I didn't know of any fossiliferous rocks in that area, and this seemed worthwhile. So we advertised a field trip to this area. Seven or eight students showed up and I began to wonder, "Suppose this turns out to be 'nothing' and I've led all of these people to 'waste' an afternoon. I wonder if he is going to show us outcrops or if he's just got some glacial boulders? If that's so, we'd be better off, from a scientific point of view, staying around here."

It was a beautiful sunny day, cool, the ideal type to be out doing careful mapping. My apprehensions started to rise, but then a kind of calmness set in. "Pete has something that's important to *him*, that has excited him. If I try to take responsibility for the enjoyment others find in this, or if I judge how 'relevant' and 'useful' Pete's observations are, why then I'm doing just what I did to Debbie and being just like the guided-inquiry instructors who inhibited *me!*" So I tried to let myself become open to whatever experiences would arise, and the nature of the "fossiliferous rocks" became secondary rather than a principal factor on which to judge the success or failure of the trip.

Pete wasn't home yet when we reached his house. So we sat on his front porch with his mother and talked about Pete, his job, his home town: getting to know more about him. He arrived, excited but also worried: had he brought us all the way up here to see something that we wouldn't find important? He had gone out the night before, apprehensively and feeling a great deal of pressure, to be sure he could locate the spots he wanted us to see.

We drove out along the St. Lawrence Seaway. Conversation was about the locks, the aluminum factory, the river, Pete's excitement and "Gee, I hope you'll find this interesting, too." Sure enough, as we drove up along a dike

of huge boulders that had been hauled in to make an enormous retaining wall, I saw that we were going to see boulders rather than rocks in place, in outcrops. I no longer felt apprehension, nothing about "waste of time." Beautiful day, seaway, excited feeling in the car - *being open to it*. The group in the car clamored over the boulder pile for several hours. Questions flew from all sides. The group felt close. Pete felt validated. I felt open to what was really going on. Openness to what really happened rather than expectations aimed at limited objectives led to a profitable, nourishing, energy-filled afternoon.

As far as seeing fossils in outcrops was concerned, we scheduled a later, day-long trip to areas further away where we could be sure of seeing rocks in place. Students who had been on the earlier trip found themselves "tuned-in" to the fossils. They also worked together exceptionally well as a group. Part of their energy on this trip was undoubtedly related to the good feelings that began on their trip with Pete.

Of course, the whole thing can get off the center-point of balance in other ways, too. In my first days at St. Lawrence I took a group of advanced students to work with me in the field. It was an optional trip and the half-dozen people were vitally interested. I told them in advance that I wasn't going to lead them around I felt that when we "laid it on" each other we effectively limited each other rather than having a chance to see with the unique viewpoint each of us carried. Peppy looked at me wistfully and said, "Can we even talk to each other?" OK! Score another one against the "teacher." Somehow I want to establish or participate in groups where we see independently, where we are aware of many things, and where we enhance and expand each others' observational "powers" rather than limiting each other. This means that any interest is potentially valuable to the group. We can talk about anything as long as each of us considers his or her own interests and observations worthwiile. Only when I assume some special status or when learners attribute some special value to my observations and allow my views to supercede theirs is there a problem.

At one field locality, a group of us were crawling around looking at a roadcut. I became aware that two of our number were standing by the road observing the passing cars and involved in a profound discussion about automobiles. My first thought was, "Win a few, lose a few." Then I realized that I was still a victim of my own rocky blinders. Passing cars were as much a *now* aspect of that location, worthy of our awareness, as was the outcrop. Who knows what ideas suggested by automobile observation might actually have some bearings on a geological field observation some day. Ane perhaps the mere visit to the outcrop may have been a factor in arousing long-term interest and later revisits. One of the students who stood talking about cars later became a geology major in our department, and has now gone on to teach earth science in a secondary school.

In a field "course" we are now conducting, students ranging from inexperienced, early-level students to some of our most advanced people are assigned the task of mapping the regional geology of areas near our own school. (Similar things could be done in field biology, soils, social studies, and many other areas.) Small teams (two to four students) have as their task the detailed mapping of an area of several square miles. They devote about 16 to 20 full days to this activity. Instructors rotate from team to team and act as ordinary team members who just happen to be a little more experienced. It is not their job to "teach," but merely to join in the search for information and meaning rather than a looking for "right answers." Often the instructor is working in the area for the first time, too. Although he may have a better picture of how the various parts of the "jigsaw puzzle" are beginning to fit together, he must, along with the students, be involved at a truly investigative, process level rather than at the level of showing others around.

We have also insisted that the various teams work together. We accomplish this by asking for a single report with a single map that anywhere from 10 to 35 students have contributed to. Thus the participants must work out their own compromises to problems. When observations of adjacent teams don't fit together, the two (or more) teams must go out together and work out their differences. This is the way professional scientists work, and we want even beginning students to have this opportunity to integrate their work with that of others. Cooperation, not competition.

Longer trips in which we live together provide an especially favorable context for the development of an environment for confluent education. A month-long geology expedition to work on volcanic rocks in central Oregon provided Bruce, Steve, Don, Jim, Bill, and me with an opportunity to see the world as a whole and also to concentrate our attention on certain features of volcanic areas. A detailed account of what each of us learned would extend way beyond "rocks."

On a month-long internship at the St. Paul Open School, fifteen of us rented an old house in inner-city Minneapolis. In many aspects this became a genuine commune, although short-lived. The communal living experience was equally as important as our daily work in the school. Experiences at self-governance and the constant dealing with the diverse interests of fifteen energetic people nourished us with energy and ideas for our work as facilitators of learning in a school devoted to confluent education.

Virtually any "live-in" experience of even a few days duration carries in it the potential for a kind of synergy leading to the highest imaginable quality of learning. True confluence may, as a matter of fact, *re-*

quire a certain number of high-intensity personal experiences of this type. More and more schools - including very ordinary public elementary and secondary schools - are working toward these kinds of experiences. Many nature centers offer residential facilities so that whole class groups may go off together for weekends or longer periods.

Even short trips to museums and other local-interest areas help to transcend the wall that separates school and community. I have begun taking regular, optional (note my continuing emphasis on this word) trips to the Natural History Museum, Museum of Science and Technology, and National Art Gallery in Ottawa, eighty miles from us. Recently, I put up a low-key advertisement about such a trip and a sign-up list on my door. Forty-five people went on the trip! I was interested to observe the difference between our informal group and a group of younger Canadians who were in the Museum of Natural History at the same time. These students were being shepherded as a group from exhibit to exhibit to take notes. Periodically a teacher would threaten a student, "If you don't take notes, you'll fail the test." In our group (admittedly comprising more mature people), individual members of the group would grab hold of other group members to share and extend their excitement. Our group had a nourishing interpersonal quality; the other contained many toxic elements. (I should add that I have seen many groups the age of these younger students who have been given more or less free rein, and they have profited from the experience and not "destroyed" the museum!) By legitimizing the seeming "small talk" and exploration of *seemingly* irrelevant activity, the "open" trip actually legitimizes a serious kind of *intrinsically based* intellectual activity, too. Attempts to inhibit the natural playfulness and spontaneity of participants may also close them to cognitive growth in that environment.

In the ES materials, we have placed heavy emphasis on getting learners out of the school room. Our approach there is to legitimize *whatever* a learner is aware of in his surroundings as a take-off point for exploration. No more, "This is what you *should* see here," but rather, "What things *do* you see here? How do those things differ from what I see, he sees, she sees, they see? How much more can we all see by pooling our awareness and sharing perceptions?"

SKILL PACKAGES AND PROGRAMMED MATERIALS

Programmed materials are presently appearing in profusion. All you need in order to get them is money, and the price tags are often high. To the extent that I can afford to procure such materials, I will do so. Many libraries are beginning to take over the role of making audio-visual tutorial (ATV) learning packets available to the whole school. In most places, individual teachers and learning facilitators who want programmed materials must set up audio-visual-tutorial learning facilities of their own.

Many educators are following the leads suggested by S. Postlethwait of Purdue University, a pioneer in the AVT movement. In the ordinary AVT program a whole group of students moves along through the same basic set of materials in the same order, and at the same rate for the group as a whole. Individual learners spend more or less time, as necessary, to complete the work, but basically everyone is expected to finish the same work in a given amount of time (= a grading period). Grade is usually related to amount covered as verified by criterion tests (often multiple choice).

The usual AVT booth consists of a chair, table, and perhaps some shelves housed in a small carrel or cubicle where a learner sits alone and works. The booth may contain a tape recorder, some kind of color-slide viewer, and assorted equipment. The equipment may include a microscope, tools with which to perform experiments, maps, books, prepared slides, and special set-ups for individual experimentation.

Courses organized primarily on an AVT model frequently also have large-group meetings scheduled so that learners will feel less isolation and may have more contact with the "voice on the tape." Discussion groups or quiz sections may also be scheduled and these may be required or optional in various AVT courses.

Much research on AVT courses shows the importance of having the voice on the tape be that of a person the learners know. Music, jokes, and humor are often used on the tapes. Statistical studies show that these reduce the tedium of working with the tapes and of working alone most of the time. In addition, many of the better AVT programs direct learners to leave their carrels from time to time and go to a separate area of the lab where larger set-ups, often allowing several people to work together, are established. Many instructors feel that having the basic subject matter packaged in this way actually increases and improves the quality of their contact with learners rather than reducing it. They feel freed somewhat from the dispensing of information and are able to deal personally with individuals and in problem areas where individual learners *seek* assistance.

One of the big problems about this approach is the necessity of having a room-full of set-ups all equipped with the same materials, tapes, slides, etc. Here at my university, for example, the beginning biology program is set up as an AVT course. Two large labs are almost entirely filled with small, bare cubicles where students sit, separated from each other by partitions, and listen to the same tapes - at their own rate, mind you, making the program "individualized." The course instructor has a tape-copying

machine where he must spend hours each week making dozens of copies of the same tape. The materials problem and the repetitiousness for the staff must be deadening. Time and energy that could go into creative development are directed into mass production of a few good ideas.

A new movement afoot in AVT programs is the production of taped mini-courses. These provide materials among which learners may select from time to time rather than having to follow along a single track. Side excursions are allowed. These departures from linearity seem to respond to individual needs more than the older, straight-line courses. Still, at the present these remain limiting and limited in scope.

In a few places, more truly "branching" AVT models are being explored. In these, an AVT unit contains numerous suggestions for digressions. Many units become "trigger units." A learner can elect simply to follow a new line of interest and even have permission to go off on completely individualized work of his own choosing, with no requirement that he finish any special coverage of more general materials to complete the "course." So far, all attempts I know of at developing *branching AVT* models provide so few options and are so timid and still limiting that their real potential has not even been touched. I think they may possibly provide fine potential transitions that could help learners decondition themselves from the high dependency on outside help many of them have acquired and could allow them to develop confidence in their ability to direct their own studies and to actualize their own potential to a much fuller extent.

Programmed materials may help in conveying subject matter and in teaching specific skills. They have little to do with the "confluent" part of confluent education. Any general-purpose, programmed unit cannot, in itself, assure opportunities for the integration of emotional and cognitive factors. To an extent, they can set up a pattern of reinforcement assuring a learner that he is progressing satisfactorily in learning specific subject matter at some criterion or performance level, but they rarely respond in a personal way to the emotions and feelings a student is having as he interacts with the materials. A sensitive and open instructor who is truly available while the learner studies can provide the "confluence factor." From talking to many students in many different schools and subject-matter areas, however, I have to conclude that the AVT course in which a confluent variety of education appears is rare indeed. This may be more a problem of the attitudes of the instructors than of an AVT approach itself. Mechanization may lead to mechanical approaches unless teachers are very sensitive to their students as people.

In the learning environment I am presently trying to develop, we have set up two AVT carrels. We have used inexpensive gear and are treating the AVT materials just like any other resource units. They are totally optional. Rather than making twenty or fifty duplicate sets of material for any given unit, we generally make one or two. The materials acquisition problem for new units is greatly reduced. Since the units are optional, we are less concerned about technical perfection and assume that the person electing to use the units is intrinsically motivated. This further cuts down the production time for a given unit. Lack of concern over technical factors, however, may lead to sloppiness, and sloppy materials may not be attractive enough to be selected.

Some of our AVT materials are commercial ones we buy and place on the shelf. Others are made by faculty members Yet others provide a way in which individual learners involved in work of their own can produce a program to be left behind as a record of their work. These learner-produced units are being increasingly produced and used. (Unfortunately it is too early to provide detailed records about the overall extent to which these facilities are used, and our time limitations, just like everyone else's, makes the growth of the tape bank much slower than we would like. We need released time to create units, but so far we have not been able to obtain help. The frustrations of having many more things that we want to do than we have time and resources for constitute a condition we live with!

Some units are intended as guides for basic exploration. Many trays include a tape, slides, a written study guide, and materials and equipment or a list of "what you need to work through the unit." There is no requirement to finish a unit once you begin one. There is little linearity involved and each tape is as self-contained as possible. If a learner finds the level of a given tape too high for him and yet really wants to work on the given subject, then we try to help him work out a way to acquire information and skills that may be effective prerequisites. When a student approaches us with certain kinds of questions ("How do I...") we often direct him or her to an appropriate programmed unit if possible.

I have gotten to enjoy making "guided field trips." In making these I carry a tape recorder around with me in the field. I take color slides, gather samples, maybe even do sketches and a sketch map. I talk to the tape recorder as I might to another person about what I am seeing, what it means to me, how I feel about what is going on around me. I want to share with anyone who uses the prepared unit as much as I can of my real, overall process as I work. I call these "field trips with Romey." Some can be placed directly on the shelf; others require editing and re-dictating. In general, I like the strictly spontaneous ones best. They capture the moment with its real excite-

ment as I stumble onto something unexpected. They also convey the feeling of hard work, tiredness, annoyance at mosquitos, wrecked hypotheses, difficulty in obtaining data, my changing opinions - all of the things that make up activity in science.

Another valuable resource lies in the 8-mm motion picture film loops that are being produced by many science film makers. These can be used to good advantage in audio-visual carrels and also in other demonstrations. I am told that they can be made fairly easily as "amateur" productions. I hope to try soon.

John Whetten and others have begun using portable videotaping units to record field trip activities. This is much easier to handle, although more expensive, than film loops. Even though vicarious experiences with field activity may be less satisfactory in general than personal experience, we live in a TV and film culture, and careful use of these media can constitute an invitation to later, personal, inquiry by students. Perhaps better still, tapes and slides may provide a vehicle for review:

"Did you notice the...?"

"No, I must have been off somewhere on my own!"

"If you're interested, I think it's shown on the videotape."

"Yeah! Let's go look at it. You've really got me curious now!"

We have begun to prepare short, mimeographed field-trip guides that people can take along on bike rides, Sunday picnics, walks, or automobile trips. These give a short description of local background and then suggestions about where to stop and look at things. The Geological Museum of the University of Oslo has actually painted numbers on rock outcroppings that are keyed to an excellent pamphlet describing geological relationships and features in laymen's language. Such guides may deal with fauna, flora, earth shapes, rocks, industrial and social conditions - all aspects of the world-as-a-whole.

Lab-oriented packages include exercises I used to use as normal class activities. Some skill-oriented packages provide instruction about how to use certain items of equipment. The availability of time to produce units remains a problem. I find that the mechanics of making new materials are relatively simple. Anyone interested in preparing materials can take almost any lab manual or study guide and redo it so that an individual student, working alone, may use it. To give myself a basic set of materials to begin with, I took a lab manual I had written earlier (*Investigations in Geology*) and tore out all the pages. I took the pages for each major lab and placed them in a drawer together with a set of all of the equipment that would be needed to do the exercise. A set of special, "how-to-use-this-tray" instructions told the user what extra things he might need and where to find these materials. For my own lab manual I also provided cut-outs from the teacher's guide I had prepared, too, since the learner was now acting as his own instructor. Any lab manual can be used in this manner. Given the enormous number of lab manuals in all of the sciences, there are many resources available to facilitate this approach to the adaptation of study units.

A problem arose with these materials as I began to use them, however. In a required AVT lab, you can make packages that require an hour or two of activity. Probably, the average commercial AVT unit aims at about two hours' worth of activity, the time of a "usual" lab period. When the unit is completely optional, however, long units seem not to be chosen. If a main purpose of the units is to trigger further intrinsically motivated activity, then perhaps the units needed in an open AVT lab must be very short and imaginative. They have to attract people - perhaps by interesting equipment they contain, and they must not be too long. For my own lab manual, I have noticed that people rarely "finish" one of the old labs. This is a clue that I must break each lab down into perhaps three or four *short* labs that a learner can try. Each might be designed to take only about a half an hour. I am presently involved in trying this out.

Straight Computer-Assisted Instruction (CAI) is also receiving much attention. Here, too, the problem is basically that the CAI units are required and they drive the learner on to what the programmer thought was important, rather than responding to the real mental and emotional processes of the learner in optimum fashion. We have just acquired some programs from the department of geology at the University of Texas. We hope to place these in our overall resource environment and will encourage our learners to go to the computer terminal and "dial Dartmouth" where our terminals are hooked in on a time-sharing basis. This may add a new and important diversion for people who are excited about computers. And if they are totally optional rather than required, I suspect they will provide better learning resources for our people.

All of these skill packages require lots of time to prepare and organize. If I pretend that I can do it all myself, the environment for learning will grow very slowly. If others in the community elect this as a way of communicating and sharing, the work proceeds rapidly. Fifty of us or one hundred of us can rapidly build a resource bank. Without a community effort we need large amounts of money and professional assistance first. Without personal relationships, a sense of community and communication, it probably won't work anyway!

An additional kind of programmed material I have not mentioned yet deserves to be noted. This is the simple paper-and-pencil program which gives you something to read, then asks you to analyze, answer a question, and then check your answer. If you're correct, you go on to page x. If you're wrong, you go to

page y for another approach. Even these simple programs can be useful to the learner who has decided for himself that he wants drill in a certain area. In this way he can do much useful study on his own. As long as these programs are there as more games to play rather than as more bludgeons for me to use, they have a place in any learning environment I might be involved in creating. Fortunately, many commercially-available texts now have accompanying study guides that can serve as such learning aids.

In the long run, I hope that learning facilitators in various institutions might be willing to exchange materials. "I'll send you our latest unit in exchange for a set of yours!" If this ever happens, *then* learning environments everywhere can grow at an unheard-of rate. But will the American commercial ethic with its copyright and royalty fixation ever allow us to do this?

I almost give up on programmed materials every now and then. Their preparation requires a lot of time and, in an environment of optionality, no one *may* ever use them. But then a few people "bite" and that teases me on. At the St. Paul Open School I saw an AVT environment functioning in a confluent manner. Two areas in one part of the building were loaded with booths of many different kinds and there were attractive file units all around. The area was always busy. Students of all ages and with all sorts of interests could go there whenever they wanted to and "play" with the materials. The equipment itself was seductive, and many students worked in pairs or small groups. Perhaps most important of all, one and often two teachers were always present. They knew the equipment and materials in order to provide ideas and guidance. They also knew how to maintain the equipment and materials. In this respect the environment resembled that in I.P.I. (individually prescribed instruction) centers except that suggestions and advice replaced "prescription." For me, working more nearly alone, as is true for most teachers, problems of maintenance sometimes seem overwhelming. And students will not come unless the materials are easy to use and do not contain too many frustrating "bugs" in them. For a programmed-materials learning center to function optimally, a great deal of energy and loving care must be poured in. There is probably an "energy-materials threshhold" to surpass in order to get such a facility functioning. I saw one really working at St. Paul in a truly confluent manner. Good human things were going on between the facilitator and the learners and between learners and other learners. Emotions, cognitive factors, and psychomotor factors all worked together. I'm still working to develop a higher energy level in my "programmed learning center." For such a facility to operate satisfactorily, a commitment greater than that of a single teacher or two is probably needed. I still have great hope for it.

COMMUNICATIONS SYSTEMS

One of the most essential elements in any learning environment involves the communications systems. Note that I place this in the plural. In an open and confluent environment communications systems become critical to adequate functioning.

In a conventional class situation communications would seem fairly simple. There is a course catalog or description. It and individual class schedules tell people where they must go and when. Once they arrive in the classroom, attendance is taken to be sure they are there. In most public schools a report of attendance even has to be transmitted to the office. The old ethic about "how to run your class" tells you always to write the assignments on the board and make everyone copy these down. Never take it for granted that an orally given assignment was ever really made! Perhaps it's better even to ditto off the assignments and pass them out. That way you're sure everyone has "got" it. Furthermore, the class (in public schools at least) can be interrupted at any moment by the droning voice of the principal or vice-principal making an announcement over the loud speaker system. That is modern communication, they tell us.

The trouble is that communication is a two-way affair. It requires a sender and a receiver. I can make people copy things down. I can even make them learn something by heart so that they can recite it back to me verbatim. But I still cannot be sure that I have "communicated." I can say one thing and it may be interpreted in a totally different way. Or I can think you said one thing when you really meant something else.

This is particularly well seen in international relations. An essay in *Newsweek* entitled "Why Can't We Understand Japan?" states, "Could you learn all the words in a Japanese dictionary, you could not make yourself understood in speaking unless you learned to think like a Japanese - that is to say, to think backwards, to think upside down and inside out." The article points out the Japanese contempt for literalism. Body language, facial expressions, and gestures become as important or more important then words. Written agreements may mean little,for the Japanese are inclined to function according to their own sense of the spirit of an agreement rather than by the letter of it. The Native American functions in a similar way. A book like *Bury My Heart at Wounded Knee* demonstrates continuing lack of communication over essentially the whole time since Europeans first took over North America. I have a strong sense of communication problems that far transcend words from all parts of my life as different as foreign travel and my intimate family life. As two individuals, you and I always speak to each other from different frames of reference, no matter how close we may think we are. It is impossible for any two of us ever to under-

stand completely each other's experience, according to R. D. Laing. When you consider that, as Charles Reich suggests in *The Greening of America*, some of us may be on whole different levels of consciousness from each other, how in the world can we hope to communicate?

In a truly open and confluent learning environment no one is required to come to any particular input sessions that I or anyone else may schedule. There are no *real* assignments as such. So how does anyone ever find out what is going on? I may be psyched up for the best and finest presenatation of my life, but if I simply go into an empty room or into the corridor, or out into a field and start to talk I touch no one, even though I may still experience joy in expressing myself.

An essential aspect of the learning environment thus becomes an *intrinsic spirit of communication*. People either want to let others know about what they are doing and they want to hear from others or they do not. Furthermore, you can't just "create" an environment of communication and have it stay put. It comes and goes in the best of places. There are times when I really want to communicate. There are times when I really don't want to communicate. No one can force me into a mood to send or receive when I don't want to. And, regardless of how much power I have or try to use, there is no effective way I can really force others to accept my communications or to communicate with me, even if I wanted to try to force communication!

There may be some ways that I can contribute to the spirit of communication, however. To the extent that more people want to contribute, the overall environment for learning will be improved. One thing I know is that I am willing to go more than half way in seeking to communicate. If I am willing to go only half way or less, then my experience tells me that I will feel bad about it and communication will be poor. On the other hand, I am also willing to accept now that some people will reject my communications and even be antagonized by them no matter how much or little I try. They will not respond to any advances I make. (Similarly I begin to accept that I choose not to communicate with some people in the environment, myself!) I still worry a little about when people simply do not respond, but if I allow myself to dwell on this after many attempts, at that point I realize that I am perhaps trying to take responsibility *for* others. I realize more and more that I will not try to be responsible *for* other people in the learning environment. As an example, after a full year of trying every device I could think of to "get the word out" John continued to come in and say, "I didn't know that was going on." I finally accepted that the problem was John's and not mine. Then I could say that to John and, having said it, accept again that he might not even have heard me say, "That's your problem, John!" Or when Pat missed a field trip she said she really wanted to go on because she was misinformed about the time. I declined to take responsibility for Pat's failure to inform herself. (I still felt bad, though.) Incidentally, she made the next trip with lots of time to spare.

On the other hand, I was recently on a field trip where everyone seemed to know about a big party to be held in a small town 30 miles away. This had not been reported in any newsletters or other special channels. If the events within the learning environment are of sufficient interest, people will attend them. People who miss interesting events will make it a point to inform themselves about later events. If no one shows up at an event, then the event may not have been a very worthwhile one. However, if no one comes and I really think an event is important, I'll try to repeat it before I finally accept the tacit verdict "uninteresting." Interest also depends on time, context, and the particular group. What may "go" today may not "go" tomorrow and vice versa.

Word-of-mouth may be one of the most effective means of communication in a confluent environment.

This is all very fine and philosophical, but I hear you thinking there must be some concrete ways of *facilitating* communication if I'm being paid to set up the learning environment. Here are some of the things I'm trying right now.

We put out a little weekly newsletter. At first I put it out single-handed and when I didn't get around to it nothing happened. Most of the items were things I put in. Finally more items from other people started to come in and some of the learners in our group took over pretty much full responsibility for having it out on a weekly basis. Thirty or more issues are published in most years. This is not a self-starting effort yet. One year I decided I would not start the ball rolling, at least at first. After two weeks, no one had taken up the newsletter idea yet and my patience was about at an end. Just as I was getting up my energy to start at least an occasional newsletter, Cindy and Susie took over. I guess the Newsletter was important to the group after all since they took it up on their own. What will each new term bring? I can't know, and even thinking about it can only divert my energy from the exploration of new communication channels.

We started putting out a little quarterly "magazine" - a departmental "journal" for longer papers and news other than "what's going on next week." We send this to all of our faculty, administration, and alumni as well as to our own group. This helps us to survive as an unusual community within our school; no one can accuse us of acting underhandedly. We are wide open and can always invite our critics to show their products and problems as openly as we do ours. Also our own people feel satisfaction at having a vehicle for disseminating their ideas.

We've set up some big hall bulletin

boards - schedule boards - on which anyone can hang a notice of any event he wishes to conduct or participate in. We try to keep notices of both regularly occurring events and of short-term events.

A "people board" has now gone up, with small areas identified for each "major" in the department. People who want to communicate about what they are doing are invited to do so via this special bulletin board.

We also have two large blackboards where the special events of the day and of the week often are written up. Here again, I find that I may be a major contributor of schedule data. Even the rest of our faculty still don't use these communication devices much. But that's OK. Anything that seems to reach too few people can simply be junked. Also, what didn't work last year *may* work this year. No need to institutionalize any of these means of communication, however. They need to be reassessed, reinvented, or replaced by each new group.

We had big rows of individual student mailboxes put up in our corridors near the main entrance to our building. We also had a separate set of special, large mailboxes for our majors put up in our special "majors' room." These provide contact points, as long as people check their boxes. For one, I also can find out which students working with me are *not* picking up their mail. I get a rough idea, an unobtrusive measure, of "attendance," defined in terms of how much people are at least checking in to see what's going on. So far I'm the only faculty member who is using the mailboxes in any very extensive way for our beginning students. Essentially the only boxes in the main hall that have names written into the name slots are ones taken by people working with me. This frustrates me in a way, but it points up again that I can't force my communications systems on either faculty colleagues or younger learners. All I can do is continue to try to provide new devices for departmental-wide communication and hope that some of them will take hold.

We have an ever-changing student population and each new population must re-invent its own ways if there is to be an *intrinsic* kind of communication. Fortunately we do have advanced students around, and these people add stability in terms of operating communications systems and spirit. The other side of that card, though, is that "systems" can become too stabilized and not respond to the new people always joining us. The systems must remain flexible and changing rather than having us expect each new group of people to adapt to the system. The people must come first. Then appropriate systems can evolve naturally and functionally.

We have an active geology club that also acts as more or less a departmental parliament. They have a voice in how we allocate financial resources and other such matters. They also affect who is admitted to be a major, what activities are scheduled, what courses are offered, etc.

All staff meetings are open and any learners may join us in these meetings, and have a vote, too.

All faculty have bulletin boards on their own doors, too. (I find myself avoiding the word "office" for my room. I also find myself a little uncomfortable with the word "my"!) I use this as a place to hang notices, also.

Whenever I have something special to say, I am apt to write it out or type it on a ditto master and run off multiple copies which I distribute to people. Others have full access to the ditto masters and machine if they wish to communicate in this way. I write individual notes and letters to people often. If I know people are interested in a particular topic and come across a reference I think they might be interested in, I jot it on a piece of paper and send it to them. They return this favor in kind. Incidentally, that's the way that science works in the professional world. We often see the development of what are called "Invisible Colleges" in which people interested in a given topic find out about each other and exchange ideas and informal manuscripts. If we are in the business of learning science and helping others learn it, then I want to engage in the same processes of communication with beginning learners as I do with the senior scientist I may contact about a common interest we may have. Communication requires an environment of sharing.

Most important is the kind of communication that occurs spontaneously when two or more of us sit down together just to be together or to talk. This happens at the gym when I go to run, swim or sit in the sauna. It happens when I go into the student dining halls, to a Friday afternoon beer session, and it happens very often in my room and the lab and corridors of the science complex. Sometimes it is scheduled, but more often it is highly informal. These are the times when relationships are established. When the relationship is there, so will be the communication. Intrinsic communication.

CONTROL

The operation of must schools is now built on the idea of control. The traditional first function of teachers is to control their students. Even at the college level, the notion of *in loco parentis* dies hard. It expresses the idea that parental function is one of control, too. Most children grow up in a societal system dominated by extrinsic controls. We see this in the way government functions, too. The President of the United States asks for voluntary self-control on price setting and the inflation rate doubles or triples. So he imposes more controls. Then when the inflation rate slacks up he removes controls and the rate immediately doubles again. He expresses surprise

and disappointment. Let's face it, if we educate our children to respond to extrinsic controlling forces, then they will become adults who wish to control and be controlled.

When I am controlled by someone else, I don't have to take responsibility for myself. A lovely little book entitled *The Controllers* expresses pictorially the notion of control and its adverse effects on the assumption of personal responsibility.

Many people are now criticizing "science" and blaming scientists for creating the theories behind the atom bomb and other technological advances. They blame the technologists for inventing the bomb itself and for applying the theories developed through so-called "basic research" to the production of various devices, to space exploration, to genetic engineering, etc. True enough, many scientists and many technologists refuse to take responsibility for their personal actions, too.

> *I just became aware that I am creating boxes between scientists and technologists again. People are doing that these days, as if there were something purer about the former and baser about the latter! If I call myself a scientist I think I can avoid responsibility for the technological mess and people will let me go back to my lab and create new knowledge, which is always good in the long run, I can say. If I admit to being a technologist I throw the blame either back on the scientist who created the theories I am working from or I can blame the public for the way it uses and exploits my technological invention, which I still regard as pure! More copping out on responsibility!*
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> *"I only do what the boss tells me to do!"*
>
> *"I was just a soldier in the ranks, obeying orders," as the defendant who worked in Dachau in 1943 said at his trial.*
>
> *"I just wanted to make sure Richard Nixon was re-elected, and I really didn't know all these things were going on," said John Mitchell.*

We have a character around our house called "Mr. Nobody." He's the one who always did whatever no one else will take responsibility for having done.

In the kind of confluent environment I want to create and work in for learning science I want self-control and personal responsibility from the people who use the environment. I have to come to accept, however, that a massive deconditioning process - *real therapy* - is needed before these qualities can be developed. This is one reason why encounter-type groups and personal confrontation as opposed to superficial politeness (followed by subsequent back-biting) have become important to me as vehicles for the growth of *intrinsic* personal responsibility.

For one thing, I think that people who are willing to take responsibility and who have the capability of intrinsic self-control and self-regulation will make *good* scientists, science teachers, and laymen literate in science. People who fail to develop these personal qualities will be poor scientists and science teachers. Or, as laymen, they may become enemies of science or at least irresponsible critics. Which is more important in science education in the long run? The retention of superficial or even in-depth scientific knowledge, the ability to perform experimentation and to exhibit "scientific" skills? The ability to solve problems? These are the usual objectives reflected in science courses. Or are personal responsibility and intrinsic self-regulation and control so basic that really first rate science or appreciation of science are impossible without them? I know that I do poor science if a primary goal of what I am doing is to please someone else or to meet his control standards. I have worked with enough other scientists and graduate and undergraduate science students to feel comfortable in generalizing that science done in a high-control environment is likely to be both unimaginative and technically deficient.

If I decide that I want control to be within the individual and that this is a pre-condition to good science in the long run and even to the functional learning of science at all levels, from lowest to highest, then the way in which I function as a person paid to help people learn science will be vastly affected. If I decide this, then I first reject my own tendency to try to control other people, for they will be less likely to learn to be self-controllers as long as I insinuate my controls. It also means that I accept full responsibility for my rejection of the role of controller, too! It means that I want to express in my own actions responsibility for what I do. When "policy" says I must take attendance and I decide this is unacceptable control over learners working with me, I take responsibility for either doing what I regard as an essential pre-condition to the facilitation of learning in science or I take responsibility for being controlled by "them" and taking attendance "against my will." The same is true for giving grades, for making assignments, for approving projects, for locking up all of the labs and lab equipment or for leaving them open for complete access, and for most other things that become controls I exercise over others.

Lots of people come to me and try to make me into their controller. They say, "Tell me what to do," "Make me come to class, otherwise I'll slough off," or "What do I *have* to do if...." If I accept the role of controller, to what extent am I ultimately promoting the growth of the learner, my own growth, and the growth of science itself? This is an issue I choose to deal with di-

rectly as a primary function with other people - colleagues, friends, family, other learners I interact with.

I stumble a lot. I take responsibility for *my* stumbling. That's the way I learn. Gradually I become more aware of ways in which I still try to control others, accept their control over me, or accept the subtle ways in which they adopt me as their controller. When I develop what feels like a truly control-free relationship with someone it's *glorious*, and I'm feeling more and more of that kind of relationship developing in an open learning environment.

OUTSIDERS AND EXPERTISE

Visitors from outside the normal population of the learning environment provide important inputs. People are pleased to come if they can participate on their own terms. In conventional school situations visitors go in on the regular teachers' terms and are faced with many rules. I always feel out of place when I am on a "formal" visit. I offered last year to go in as a teacher aide in some science classes around where I live, but the teacher feared me as an "expert." All I wanted to do was *be* there, and help children who wanted me to work with them. On several visits to open schools I have felt immediately comfortable because everyone was willing to accept me as me. No advance "preparation" needed; no status to hold up; just being *me* with all of whatever in my life and experience may be of interest.

At the St. Paul Open School they have a whole cadre of occasional and regular visitors - parents, retired people, young people who just like to be around children and work with them. There are so many "working visitors" that the school employs a full-time person as coordinator of volunteers to be sure that people are used as effectively as possible and also get the best possible chance of having an experience that will make them want to keep contributing time and energy. During one school year, over 900 volunteers contributed their energies at the St. Paul school for periods ranging from a few hours to, in one extreme case, 800 hours (the equivalent of full time).

No one took any special notice of us when 15 of us went there to intern for a month. We just immediately got to work. Students go up to anyone who happens to be nearby when they have questions. Sandy, a pre-med student with us, was surrounded by kids as soon as he started to dissect a frog. Dinko's interests in earth science were quickly discovered and explored. Nancy was up to her elbows in batiking as soon as she stopped there to watch for a few minutes. Bruce - an earth science student - got involved in race-relations problems and spent most of his time doing that.

Greg, 14, quickly pressed me into service to help him with a glass-bending problem and a chemistry experiment. Ben, 6, brought a worksheet up to me and asked me to help him fill it out. I helped him with his writing while he showed me, on a model, how a steam-engine works (something I did not know at the time). Dian, 11, led me up into the menagerie to help feed a boa constrictor. When I was sitting around one afternoon, Joe, a teacher, called me over, "Hey Bill, will you help these two girls (about 16) with their spelling on the report they're doing?" Everything informal, flowing. We felt close to each other from the first minute. Everyone calling everyone else by first name, from the pre-schoolers to the senior citizens. I was richer as a result of the way I felt accepted and validated and the students in the school felt richer, as Joe said, "because we brought in lots of hard skills and information that the students obviously wanted and needed." And we also brought ourselves in as full and complete human beings rather than as cold and sterile "experts."

When we tried to set up a K-12 open school in Boulder, Colorado, we had commitments for literally hundreds of volunteer hours per week. Many of our volunteers were senior research and industrial scientists and academic scientists from several colleges.

If outsiders are "allowed" in only as observers or as presenters rather than as accepted, working members of the learning environment, than their impact will be slight and there won't be very many of them. Many of the ones who do come will have to be hired in. In a sense, the quality of the learning environment can be judged by the number of outsiders who come in to work and hang around on their own, and unpaid. If the learning environment is a really worthwhile and confluent one you'll have to find a way of limiting the visits of outsiders rather than working to get outsiders in. Where there is excitement, people will come. When they come, they will enhance programs, create new alternatives, and increase the level of the excitement.

I feel that it is essential not to be hung up on "expertise." Everyone who comes into the environment needs to be accepted first as a person, without regard to what he or she knows or does. Only then do people feel free to seek expertise from each other. It may be that the greatest contribution a scientist can make on a given day is his interest in music, art, literature, or wood-carving. For one thing, when a student who is doing wood-carving with you finds out in casual conversation, "Oh! Are you a *scientist*?!" then all sorts of doors to shared communication may be opened. The door to expertise is narrow and often forbidding looking until the person - as *person* - is perceived.

ELECTRICITY, ENERGY, AND PEACE OF MIND

In a well-functioning learning environment there is electricity in the air. Sparks fly. Connections are made and sustained. Lines are open. The switchboxes operate easily so that you can switch from one line to another. I feel exhilarated and jubilant when it's working and flowing. If it isn't working, if I don't feel the electric quality, then I begin looking for the short circuits, the inhibitors. Resistance and impedance often take the form of toxic elements in the psychological climate of the environment and of individuals.

Energy is a primary factor in the ultimate accomplishment of virtually any human task. The flow of energy and electricity depends to a large extent on how positively a lot of individuals feel.

In *Zen and the Art of Motorcycle Maintenance*, Robert Pirsig writes that peace of mind is essential in accomplishing anything of quality. Inner peace must be internal, intrinsic, within each person. In a confluent environment for learning, I assert that highest quality obtains when "teachers," "students," and "administrators" all are experiencing peace of mind. Ultimately each person's individual product depends upon his or her inner tranquility, but the larger environment - the group environment or context - has a quality of its own, too. When the overall quality of the learning environment is high (meaning that most people are functioning in a caring, tranquil fashion) the psychological climate cannot fail to affect all who are in it in a positive fashion. Everyone can come to function well (better) when the level of inner peace within the group is sufficiently high. Similarly, when enough negative "vibrations" are present, when the number of people feeling inner peace of mind falls below some given level, then it becomes difficult for anyone in that group to function well. Possibly, even in a relatively low-quality environment, one in which few people are experiencing peace of mind, a few people can psychologically isolate themselves and continue to feel at peace. You have probably met a few people who virtually always seem to radiate a true kind of calm, who almost always have a positive view, and who seem to function and produce even at times of widespread disruption, general anxiety, and discord. These people are rare. Their very presence has a calming and nourishing effect on any group of people who are near them.

Two terms that describe aspects of the psychological feeling of both individuals and the group are "nourishing" and "toxic." A group can be said to be nourishing when an individual who enters the group from outside immediately feels bathed in positiveness. If he had a neutral, anxious, or even negative feeling upon arrival, he soon feels comfortable and at ease. Each of us has at some time or another come into a group and felt immediately at ease.

A toxic group is one in which a person immediately feels hostility, waves of anxiety, negativity. Even when you feel good, entry into such a group makes you begin to feel anxious and uncomfortable. If you already felt anxious, you may begin to feel great emotion and fear.

Individuals who are not experiencing inner peace bring toxic currents into an environment. A strongly toxic person may soon bring about a negative change in the overall quality of a learning or working environment. This can be especially noticed when a person who has power enters the environment. A toxically charged principal can soon destroy a good classroom mood upon visiting a smoothly-functioning group. I have seen toxic professors walk into labs being conducted in an informal and high-quality manner by a teaching assistant. After their visits the possibility of productive work is greatly reduced.

A nourishing visitor has the opposite effect. He or she may bring in calm and positive feelings.

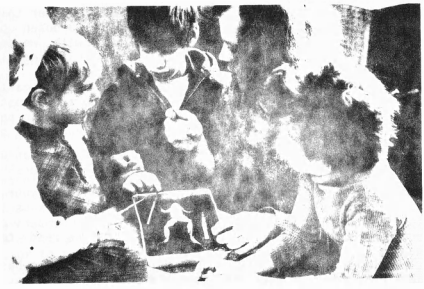
Pirsig states that inner peace of mind has no *direct* relationship to external conditions. One finds it even in the most extraordinarily negative environments: wars, gas chambers, prisons as well as in the quiet of monasteries, the joys of a tranquil love affair, the peaceful walk in a quiet wood. Yet it is clear to me that most of us affect the quality of an environment we work in and we are also affected by it. Furthermore our work shows this. We are more likely to do good work in a nourishing environment and more likely to do poor work in a toxic one.

If, as a facilitator of learning or production (teacher, administrator, supervisor, "boss"), I accept these assertions, I will try to be sensitive both to my own state of mind and to the state of mind of others in the environment. If I feel irritable, anxious, out-of-sorts, then the likelihood of my being effective diminishes greatly. I can't control this according to someone else's schedule either. Even though I may be scheduled to "perform," I may need to remove myself from the environment if I hope for it to remain nourishing. Pirsig suggests that putting off the job for just a few minutes may be enough. Carl Rogers and others suggest that being open and honest with others about a lack of inner peace may also serve well. Trying to conceal anxiety or bad feeling may be the best way to prolong them, thereby poisoning the atmosphere further still. I must ultimately develop a finely tuned awareness to my own state of mind. Cognitive learning can only suffer if I fail to do this.

If, as a group member (student, worker, or otherwise) I accept these assertions, then I must keep aware of my inner state. If I begin to feel anxious, I may need to take a break. If I begin to feel hung-up on a problem or if I make mistakes or have set-backs of one sort or another, I need to

develop a feeling for when I should change my activities. In a confluent educational setting I can feel able to express my anxieties. I must take personal responsibility for any lack of inner peace. If a teacher or boss is trying to force me, is insensitive to my mental state, or psychologically roughs me up, there may be little I can do other than retreat into fantasy or just quietly turn off.

Recognition of the role of the learner's or producer's development of any kind of quality can help me to facilitate learning or production in a more effective manner. It may aid in the generation of electricity and energy. If I can sense anxiety, I may be able to suggest, "Why don't you take a break?" Or I may in some other way be able to "check in" with people to see how they are doing. If I feel decay in my own inner peace I may be able to seek help from others. More important still, I may learn to *accept* help when others proffer it rather than claiming to be heroically self-sufficient.



At the beginning I accepted the idea of testing as an essential part of any learning environment. Then an awareness grew in me that testing seemed to provoke anxiety in learners. I felt their anxiety and experienced anxiety myself, too. I remembered my own discomfort and fear from times when I took tests.

Or was it the tests? Perhaps it was more the linking together of tests and grades, the confounding of judgement and "feedback." To the extent that a test provides information to the learner about his state of learning, it helps. To the extent that it serves as a basis for judgement and ranking a test is toxic. Yardsticks and measuring instruments can provide useful information, I believe, to the learner who seeks validation of his cognitive learning, who wants to see how his efforts compare with those of others and with his earlier performance. Even here, however, there is danger that a learner will gain false confidence from a high test score, which may tell little about how useful, meaningful, and profound his understanding is. Likewise, a learner may get an incorrect appraisal of his own work if he does poorly on a test. He may degrade his experience because he scored at a low level on a given testing instrument. Any person who is tested on his own experience will, by definition, do well. Any person trying to validate his experience in terms of someone else's idea of a "useful" experience may or may not do "well" on a test. Tests lead to conformity. One must ask the question, "conformity to *what?*" And is that conformity really desirable? As Laing points out, it is impossible for any of us really to comprehend the experience (and learning) of any other person. When a test appears to invalidate another person's learning experience by giving him a message that his experience was somehow "inappropriate" it may be destructive to that person, it may diminish his energy for further learning.

Tests have long been part of the learning environment, however, and teachers will continue to insist on giving them. Parents and administrators will demand that teachers give them. Learners will continue to ask for tests even though they complain about the tests that are then given. Popular magazines contain "test yourself" columns. Most people take these tests to see whether or not their vocabularies, math skills, knowledge of public affairs, etc. are "superior," "average," or "poor." In taking such tests we rarely question the judgement of the anonymous test-maker. And yet we feel ashamed if we don't do "well" on these tests even though there is no "penalty" as such attached to a low score. "I must be dumb because I don't do well on self-tests!"

I want to share some ideas about testing that have come to my attention, even though the idea of tests contradicts many feelings I have about confluent education. In developing a therapeutic approach to education it is probably better to acknowledge and use present forms as part of the therapy needed to abandon those very forms. Thus, I propose some form of tests that may help to focus on the information they can provide about learning rather than on their judgemental or competetive aspects. Before getting rid of testing we may have to use tests, but we need to redefine their forms, uses, and meaning. When this redefinition is complete, we may be ready to acknowledge that we no longer need them. Or, they may no longer even *be* "tests" by that time! I will consider tests as if they were just one more "input" of the facilitator into the learning environment.

If we want tests to help validate and clarify the experiences that a learner is actually having - to help him develop more confidence and power and to help increase his scope, awareness, and feeling that his experience is "valid," our tests must be designed to open the student up rather than to close him down. We want to help him focus outward, to see things as complete gestalts, rather than to focus inward in a destructively analytical way. It is all right to take things apart and to analyze them, but we hope always to see them in a context of a whole.

Bill Phinney at the University of Minnesota tried what he called a "metaphor" test. The term assignment was to chose 25 from 50 given geological terms and to create an extended metaphor around each of them. The metaphors generated became a basis for discussion and interpretation of what the geological features were, what they meant, and how they related to other things.

In a group of a dozen upper-level students I recently worked with, we decided to commit ourselves to the following mid-term "exam:"

1. On a ditto master write down the 3 most important questions in petrology that you can think of.
2. Write your answers to your own questions
3. Reproduce your questions and answers, pass them out to the other members of the group, and be ready to discuss them.

This exam provided a basis for several intense discussion sessions. There were no grades attached to them, because I no longer grade student work. Ideally, we would have done this one or two more times so that the group members could form an idea of how their skill in posing questions and in answering them was evolving. I "took" the test just as everyone else did. Each of us had ample opportunity to try to explain, clarify, and communicate the nature of his or her experience to the group and to receive feedback.

Dick, a biologist from a school in California gave a test to a class and told them, "You have 2 hours to complete the test. I want *one* paper at the end of this time with

all of you as co-authors. You will all get the grade of the group, and I expect "A" work from you." The group was thus forced to work together and share. A group report can be done in the same way. I recently required a field geology group consisting of ten 3-person teams to produce a single report summarizing all of their work. In order to complete the work, we went to a retreat center in the Adirondack Mountains and made a concentrated 24-hour job of it. Everyone participated and felt listened-to and validated. And the report was good, considering the time scale we worked under. No grade pressures brought in anxieties, and the group interaction was beautiful to see.

Al Schwartz tells of an exam (biology) in which a teacher presented 25 different and seemingly unrelated words in biology. The assignment required the students to write an essay that included all of those words (correctly used), made good sense, and was well written. Again emphasis was on relationships and combinations. I believe this one was instructor-graded, but I would want to use it as a vehicle for discussion.

While doing her student teaching, Mary DiSanto worked with a high school chemistry class. She perceived that grades on her tests raised the anxiety level unacceptably and inhibited the learning going on there. So she started giving no mark at all - giving no credit, positive or negative - to any answer which seemed inadequate to her. Students who wanted credit were then free to come discuss the question with her, to "convince" her that they had learned what the question was testing for, and to receive up to full-credit for the question. In this instance, tests were clearly used to enhance learning rather than to judge student performance. Mary made it advantageous for students to seek information about points of communication and misunderstanding.

Bill Elberty and I found in a large beginning geology class (150 students) that many people were apprehensive about whether or not they were learning anything. Neither of us grades student performance. We offer the students a chance to self-evaluate (grade their own work according to their own criteria), to be "blanket-graded" as a class-usually "B" or "A", or to receive a "pass" or "incomplete" at the end of a term. Bill usually passes out tests - which he then refuses to grade but agrees to discuss. We are also curious as instructors about the dimensions of the experiences and learnings of students who work with us. This is not from a judgemental point of view, but rather because we may be able to help in the learning process if we know more about how and what people are likely to learn. (There is a trap involved in our curiosity, however, and we want never to get the feeling that we really *know* how "people" learn and what "they" find interesting. Each person is unique and we can never make the assumption that he or she will want to follow the same path or use the same resources as anyone else. Still, the more information we have, the more likely we are to be able to build the psychological and physical learning environments in a way to optimize the chances of helping learning to occur.)

We decided to try setting up a system of "information inventories." To create these, we wrote up several "tests." The formats were multiple choice, and we included items to test for both information and process skills. In a given week, we based the questions on things we had "covered" in our talks and emphasized in "suggested," lab-of-the-week-type set-ups. On a table in the learning resources center, we placed the test, computer cards on which answers could be marked, and any lab materials needed for the test. We requested people to work on their own *if* they really wanted information about what they could do without help. (If this was not their goal, they were free to use the inventories as study-guides.) Students were free to go into the learning resources center and do the inventory at any time during the week. They were also free not to do it. On Friday afternoons, we took all of the completed computer cards out of an open box where people had deposited them after doing the inventory. We took the cards to the computer center, had them processed to get a raw score of number "right" and "wrong" for each person, averages, standard deviations, item analysis, etc. Then we posted the data in the lab, with names cut off and social security numbers left so that people could identify their own scores.

Each time, about half of the students tried the inventory, and different people tried in different weeks. By the end of the term over three quarters had taken at least one inventory. All sorts of people tried them - from students who appeared energetic and committed (the ones whom you might expect to be "good students" in a traditional course) to students who appeared lethargic and uninterested (the ones who would probably be perceived as likely to do "badly" in a normal course). For one thing, we found no correlation between scores obtained and predictions we might have based on our observations of students and their apparent level of activity. Furthermore, the distribution of scores was just about the same as it used to be on tests I gave years ago when I believed in tests as a basis for grading. Yet these were no-pressure, information inventories.

The inventories led to a great deal of discussion of what we considered important, how we phrased our questions, and of "meaning." Since there were no grades attached (we did not record the scores or look at them at all prior to submitting the students' "self-evaluated" course grades, keeping them only to help describe to others what was going on in general and to help us plan for further courses) we delighted in having students come to discuss answers. On some inventory items where item analysis showed an ambiguous question we had a field day discussing how various people interpreted the questions and what led them to answer as they did rather than as we had expected. Differences came up between answers that Bill or I favored, which were not always the same ones - so that students could see the

"professionals" in full but friendly disagreement. Degree of appropriateness of an answer, based on different people's understandings became an area of discussion rather than "rightness" or "wrongness." This follows Jerome Brumer's idea that when a student gets an answer "wrong," the thing to do is to look for the question the student was actually answering rather than to wonder why the answer was "wrong." Clarification, understanding, and meaning are what we should be seeking, not judgements of rightness and wrongness.

In addition to the computerized parts of the inventories we also left free-response sheets with an invitation to "write something about anything that interests you and upon which you seek our feedback." Many learners provided information in this way, too. We also included an "attitude inventory" sheet along with each "cognitive" inventory to help us monitor how such a large number of people were feeling about their experience.

The inventories provided us with a great deal of useful information, and we may want to use them again. Setting the system up took a great deal of time and effort on our part, and sometimes we wondered if this time might not better be spent in personal dialog with students. Still, we reached some students who had been seeking some kind of validation and had not yet let us know this. A continuing problem is that some students who got high scores on the inventories got a smug feeling that probably became a damper to continuing growth of their awareness and curiosity. Others who got lower scores on the inventories felt confirmed as "average students who aren't very good in science," and allowed this to inhibit their search as might any "confirmation of mediocrity," no matter how phoney it might be. The inventories had no intrinsic positive or negative worth, and there are risks in both using and not using them. Making them optional helped, and, in the long run, if we can convey through the whole nature of our psychological environment that the inventories are a game to be played in good humor - as one might do a crossword puzzle - then they are worthwhile. They prove nothing, but they may help in the search for clarity of view and understanding.

A poor response on a question helped us to see that a pet topic of ours might be worth leaving out of our own presentations in the future. The inventories thus provided us with at least some useful feedback about what kinds of things the students found interesting. There were generally high scores on "interesting" subjects and low scores on "boring" ones. Our area (earth science) is so broad that we have lots of room to eliminate almost any topics and to add others. The free-response questionnaires helped us to identify areas where people wanted us to treat things we had not yet dealt with. An inventory can thus provide a useful variety of formative evaluation and feedback with respect to how we might shape the remaining part of the course and how we might structure future courses.

I also gave a series of optional, nearly weekly, assignments involving things such as:

> Write a short paragraph (or more) describing how geology 101 relates to each of your other courses.
>
> On your way home for Thanksgiving vacation keep a log of geologic observations you make on route (things seen along the highway, from an airplane window, etc.).
>
> Make a scale map of the geology building and its resources.

There could be no right or wrong answer in such assignments but merely information that lent itself to the clarification of experience rather than to the judgement of experience. About half of our group responded to any given optional assignment of this type.

Oral exams may be useful if the pejorative feeling that usually attaches to the concept of "exam" can be gotten around. Orals are tricky, especially when they involve a committee of examiners, even though the examiners may have authority only to provide feedback rather than to pass or fail a person. At Syracuse University, I used a contract system for teaching large, lower-level courses. I have discussed these contracts at length in *Inquiry Techniques for Teaching Science* and this chapter has also been reprinted in *Studies of Teaching*. Students got credit for many parts of their contracts by coming in for an "oral assessment." This usually amounted to a short chat about the item in question such as a movie that had been seen, an article read, a lab done, a field-trip taken. Students always appeared highly nervous during the first minutes of their first visit. Usually I tried to give them a chance to describe and discuss their own experience and I asked few if any questions. If I felt that they hadn't done "enough," I suggested that they look over the item again or think more about it and then drop back later. Soon a feeling of relative ease developed between us, and the experience was a generally positive one whose intention was clearly to clarify, explore together, and extend rather than to judge and categorize. Still, I remained the teacher with right to grant or deny credit for each unit, and the students were the teachees and the flow was somewhat constricted by this perceived status relationship.

From graduate school I retain the grim meaning of qualifying exams in which 5 senior Faculty members quizzed me for 3 hours. Even though I "passed" I left with a feeling of having been emasculated. My ignorance seemed so abysmal and colossal that it seemed hopeless that I could ever complete my degree. - "A dummy like me?!" My energy dropped to the lowest point of my whole graduate-school career, and I came closer to dropping out than at any other time. This period of acute depression lasted for over 6 months, during which I muddled along in spite of my low energy, just because my conditioning had taught me not to give up. Die first, but don't give up.

By contrast, we didn't have to "defend" our theses at Berkeley, but we were expected to

"present" our results. The presentation was a festive event to which everyone went. Rather than a destructive experience, this was one in which, as it were, they gave our balls back to us. I went away feeling powerful, but wondering how much better a job I might have done if I hadn't experienced that needless loss of confidence two years before.

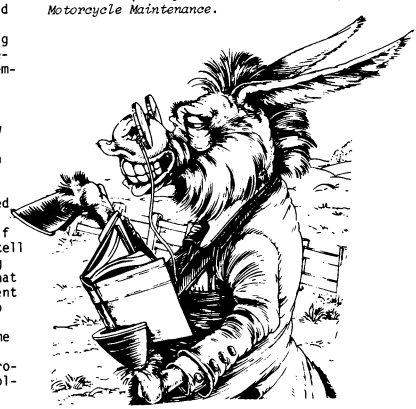
At Syracuse University, I participated, as an examiner, in a number of real thesis *defenses*. I felt myself caught up in the geometry of 5 or 6 against 1. I had to ask "clever" questions to impress my colleagues, and they - it seemed to me - were trying to impress me, judging from the way they would wink at me, nudge me with a foot, poke me in the side, or chuckle to me in advance as they confided their questions to me. The person being examined was almost secondary at times, caught in an ego-play of professionals guarding the entry-gate to their club.

At St. Lawrence, we had a tradition of a senior comprehensive oral exams. On a visit before going there to teach I recall meeting a senior student in the hall. He was all dressed up and seemed nervous, terrified. He mentioned that he was just going in for his orals, and I shuddered. The examiners were trying to make this into a positive experience, they told me. Since that time I have opposed any requirement for such an exam. We evolved from a required exam to an optional one. Although still apprehensive, I agreed to sit in on some of the optional ones. I found that, for one thing, they weren't really as "optional" as we claimed. Heavy psychological pressure existed based on the idea that if you're going to graduate school you'd *better* take this to prepare yourself. Or worse, it was intimated that if you wanted to have a chance for a good recommendation, you'd better take the oral. Still, given the optionality, I thought it might be OK. On the day of the first exam, though, the first student arrived, nervous, fearful, and all dressed up. "Oh-oh!," I thought. And sure enough, I felt the same 5 on 1 geometry developing. Worst of all I felt myself slipping into it and was soon aware of the same competitive feelings I experienced earlier as a member of examining committees. From then on I have been very cautious about participating. Interest in these orals seems to have diminished. If we really take the trouble to know our students well, there should never be any need for an examination. We should know each others' work, on a day-by-day basis.

Gary Carver, working as a graduate student,toward humanizing his department, dropped in on his department chairman and said, "Say, I'd like to know about your research work. If I come back Monday, can you give me time to tell me about it and about yourself?" This knowing needs to be a two-way affair. Perhaps now that our whole group is behaving in a more confluent manner, we could now turn such an "exam" into a celebration of clarification, meaning, and understanding. Some of my colleagues and some students say that the fact that all 5 of our faculty members are willing to sit down as professionals to a new professional and talk geology for a whole afternoon definitely shows that we *care*. But geometry and habit can be persistent and difficult problems to overcome in such a setting.

I recently participated in a "terminar" (final oral "examination") for the Union Graduate School, which is devoted to a confluent variety of education. This affair was held at a retreat center on Lake Oneida, and the candidate was chairman of his own examining committee. This, too, was an intense experience, but it had a more positive and celebrational note to it than any oral "exam" I've ever participated in. Even there, I felt some elements of people "ganging up," but there was a much greater feeling of equality among the members, who included several of the candidates' peers as well. There is merit in dialog, but the appropriateness of a special oral-exam format is still questionable in my mind.

Many formats exist for converting "examinations" into positive learning experiences that help to validate experience and provide information about new directions for growth. To me, the important thing is to remove the aspect of judgement from such experiences and to separate any idea of comparative grading. We must also transcend the idea that any examination (or any transaction between people) can be "objective." Any attempt to examine another person's experience - (= learning) contains important subjective elements. To pretend otherwise is to practice a dangerous form of self-deception. One of the most important ideas that the notion of confluent education has to offer is the idea that objective (cognitive) and subjective (affective and intuitional) aspects of learning are inseparably intertwined. To try to separate them leads to an inhibitory dualism that can only diminish the overall quality of learning. Robert Pirsig has written a compelling discussion of this dualism and its effects on quality in *Zen and The Art of Motorcycle Maintenance*.



A common, but perhaps mistaken, aphorism suggests it is better to give than to receive. A sister in a catholic, social-welfare group in northern New York pointed out to me the falseness of this notion when it really comes to helping others in significant ways. One of the worst things a social worker can do is to go to people, bearing gifts. The acceptance of gifts immediately places the receiver in a position of owing. Owing can lead to further diminishing of personal self-concept in people who may already think little of themselves. What they may need most in order to function independently is to develop a higher opinion of themselves. A feeling of owingness contributes to feelings of dependency and impotence.

You have to trust someone before you can really accept gifts from them easily! And you have to have a high opinion of yourself.

Teachers are some of the prime people I know who feel they must constantly be giving. I have written a whole section of this book about "inputs." In my own experience I find myself compulsively preoccupied with what I should be putting into the environment. Yet if a facilitator spends all of his or her time putting things in, his stock of useful contributions diminishes until little that is new or useful may be left to give.

Thus it becomes critical for the teacher-facilitator to take things out of the environment, too, to learn to accept things that others have contributed. Without continuing personal growth, the teacher loses value to himself or herself and to the group as well. I must learn to listen to others and to accept gifts they make to me. On a personal level, this may be something as simple as accepting a compliment rather than putting it down or rejecting it. It may be accepting affection and reciprocating when I feel affection, too.

On a personal and professional level (can the two be separated?) it also has to do with accepting all sorts of cognitive inputs. My growth depends upon increasing awareness, on my part, of the world around me. That means reading things I like to read, indulging myself. Self-indulgence, rather than a vice, may often be a virtue if it leads to further personal growth and expansion on my part. Going to a film or concert or reading a good book I want to see, hear, or read may be more important than grading papers, reading over a student paper, or doing something specific for school. Anything that makes me feel fuller and more enthusiastic about my life and world can only lead to a more nourishing, energy-filled learning environment. Doing it because I want to do it and not because I'm s'posed to.

Nancy handed me Alan Watts' The Book. I was very busy at the time and didn't need to start a new book. But she told me I'd find it important. So I devoted myself to it - receiving her gift and input - and found it exceedingly important to my overall set of thoughts at the time. I carried it right back into the learning environment and have "given it" to many people since then. Sharing things means receiving as well as giving. The two cease to be distinct. They merge. No followers, no leaders: Therefore no "giving," no "receiving." Sharing.

At the same time Nancy gave me The Book, Debbie sent me excerpts from Watts' book, Nature, Man and Woman, and Lucretia bought it that same day, too. When I am open to the currents that surround me - in that instance a confluence of ideas from Alan Watts all deluging on me from various sources - a student, a colleague from another college, and my wife -this may be the best time to suspend other activities to accept "gifts," surrender myself, to allow spontaneous growth. Some of the most significant things I come to read are handed to me by students. And I hand them things they see as significant, too, because there is true mutuality in our relationships. Not a pretense but a genuine mutuality.

Rich, describing his activities as a facilitator in an alternative high school program in the Denver public schools, emphasized that there can be no true openness or confluence in a school unless the teachers are also experiencing a true and functioning sense of freedom to choose. If I always put my interests second, I'll be a second-class facilitator. Balance is a key factor in personal growth and in facilitation. Centering.

COMPARTMENTATION: A GESTALT VIEWPOINT

One of the aspects of the learning environment that most inhibits confluent education is compartmentation. The sides of the compartments get so high and their walls so opaque that we can't see out of them. Sometimes they're soundproof, too so we can't hear what is going on outside of them and we can't hear each other from our separate boxes. Sometimes when I think I am outside of my boxes I look around and it seems that everyone else is still in some sort of box, and I get very lonely. Within the boxes there may at least be all of the people of one type or another. But how many of us are there who are outside rather than inside? Isn't outsideness itself a kind of box, too? And how do we find each other when there is so much open space out here? Once we find each other, how do we keep from building a new box?

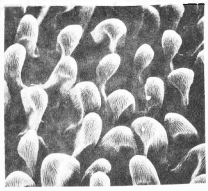
They drew a circle to keep me out.
I drew a circle that took them in!

At Round Hills, as we dealt with science in open learning environments, several of us expressed our feelings of being trapped in compartments. Jonathan offered to run a Gestalt fantasy exercise to help several of us work through and understand our concern. I invite you to try this exercise as you read. Follow along and do the things suggested. Leave yourself plenty of time for each step. Better yet, get someone else to read the paragraph to you, taking plenty of time, perhaps 15 minutes, a half hour, or more.

We all lay on the comfortable, carpeted floor in a quiet library. Jonathan asked us to close our eyes and to try to get in touch with our feelings: "I want you to relax now . . . become aware of your body. . . . Now become aware of your feelings. . . Lie there quietly and listen to the silence. . . Now imagine that you are a box. . . Become the box. . . Feel your walls and get a feeling for yourself in this form. . . . Now imagine that the box you are in is surrounded by other boxes. . . Become aware of those other boxes. . . . They are all separate from you and you are not communicating at all. . . . Become aware of your feelings about this lack of communicating. . . . Now change your compartment so that somehow you can see out of it. . . . Look at the other boxes around you. . . . Imagine that your box is somehow not so rigid. . . . Explore how flexible your box is. . . . Have your box extend outward somehow toward the other boxes. . . . Make contact with some other boxes. . . . Begin to share what is in your box with other boxes. . . . Accept what the other boxes provide you with. . . . Allow your box to communicate with the other boxes in any way you choose. . . . Keep interacting as long as you would like to. . . . When you are ready and if you feel like it, open your eyes and share your experience with others.

During this exercise I felt myself changing from a rigid, solid, and inflexible box into an almost gossamer, web-like affair that pulsed back and forth, reaching out in amoeboid form toward other dim forms around me that gradually took shape as similarly beautiful, gossamer shapes. As I think back I can now identify that more than anything else, in my fancy we all looked very much like tiny radiolarians and other web-like microorganisms I have seen magnified thousands of times under a scanning electron microscope. Only we had flexible rather than solid shells. Gradually, little protrusions, arm-like extensions, began to go out from me in search of contact with the other organisms around me. Tentatively at first, we advanced in my fantasy toward each other, and then made contact. I knew that Claudia was next to me on one side and Dan on the other. I still felt shy about touching people but somehow, with my heart pounding, I reached out physically as well as in my fantasy and found myself holding Claudia's hand. She held mine back and it was good. We felt a flow of communication. I was aware of Dan's foot touching mine and we extended our physical interaction on one side while Claudia and I did likewise on the other. An electric current seemed to flow through us as we continued in our fantasy to explore our relationship to each other as Jonathan gently led us through the exercise.

When the exercise ended, or rather when we ended the exercise and some of us began opening our eyes and sitting up, we had been there for a long time that seemed but a moment but also seemed like forever. All around the room people were in physical contact with each other as well as simply looking deeply at each other. Through the establishment of a relationship, we had somehow transcended the limits of boxes we all felt around us. Ever since then I have felt very close to Claudia, whom I saw a great deal of for about a year after that at St. Lawrence. And when I have seen Dan one or two times I have felt a closeness to him too, I continue to feel closeness with Jonathan and the others who worked through this exercise with us. We are able to communicate on a deeper and more effective level than before. We can help each other integrate emotion and learning because we accept our own personal responsibility. I think this must affect the way we can work together in science as well.



A CURRICULAR TRANSITION INTO "OPEN" AND CONFLUENT SCIENCE PROGRAMS

Several "curricula" have begun to deal with the problems of helping teachers and students move in directions that lead to maximum development of human potential and uniqueness. Ultimately, as I have indicated throughout this book, my goal is to move away from any notion of curriculum (something preplanned that you run through).

> The word "curriculum," incidentally, comes directly from the latin. There, it means "a running, course, or race," according to my little desk Webster. It always seems to be someone else's race that learners are running.

What I look forward to is much more extensive adoption of truly "open-curriculum" schools in which students make the choices about what to do with minimum interference from teachers with their expectations. Sometime, somewhere in the next few years some communities will try to establish open learning centers, doing away with compulsory "schools" as completely as suggested by Ivan Illich, Paul Goodman, and John Holt. An aspect of the planned Minnesota Experimental City was to have the community serve as the school, with no school buildings and conventional school organization at all. Unfortunately, the Minnesota legislature recently shelved this plan for "lack of funds."

In the meanwhile some transitional curricular materials can help people wishing to take the first timid steps necessary to create more confluent and open classroom environments. One toward which I am especially prejudiced is the Environmental Studies (ES) curriculum produced through the American Geological Institute. I had the pleasure of working on these materials together with Bob Samples, Dorothy Curtis, Bob Lepper, John Thompson, Rich Joko, Gail Griffith, Bob Wohlford and others. These materials finally got so ungeological that the institute refused to sponsor ES any more. And The National Science Foundation withdrew support because the materials were not "scientific" enough and dealt too much with the clarification of values and with psychological factors. We didn't fit into their standard categories any more!

The ES materials, which are now commercially available from Addison-Wesley, publishers, consist of a packet of colorful "assignment cards." The design of each card includes several elements aimed at stimulating group and individual activity.

1. A pictorial or graphic metaphor and a title. The graphic element may be a photograph or drawing of almost anything that the curriculum group chose to represent the basic idea of the assignment. A catchy one-word or two-word caption accompanies the art work. For example, the card entitled "Weed-Seeds" carries on it an attractive close-up photograph of some seeds. Each one is really a mini-poster, and I have often used them in just this way: as posters to hang around in the learning environment. Just looking at the picture and title may be enough to suggest activities to learners and teachers.

2. The action. The action line presents a short, intentionally ambiguous assignment. I have discussed the importance of ambiguity in an earlier section of this book (Convergence Versus Divergence in the Learning Environment: the Role of Ambiguity.) The intention of the ES group was that the teacher might use this action line, without any particular advance preparation, as a direct assignment to a group of people. In introducing these materials to groups of students, teachers, and administrators, we of the project staff usually either scribbled an action line up on the blackboard, read it, or said it, with no introduction at all. We said, "See you in a half-hour" (or whatever time we chose), and then we would walk out of the room and leave the group entirely to themselves. The idea is to get out of the way of the participants, to trust them to structure themselves and work on the assignment without being able to ask the teacher, "What do you want us to do?" This is a curriculum intended to get students to make their own decisions, from a performance-objective point-of-view.

Generally, each assignment of this kind leads different students to approach it in different ways. The activity of individuals in the group should be highly divergent if the teacher does not become directive. As an example, in the assignment, "Go out and photograph evidence of change," people will come up with a wide variety of types of changes (physical, social, mechanical, psychological, musical, artistic, etc.) unless the teacher "helps" by adding, "You know what I mean; things like cracks in sidewalks and that sort of thing." Such "help" generally produces 30 photographs of cracks in sidewalks. The ambiguity leads to the diversity and creativity that we are seeking.

3. More. Additional suggestions for assignments and extensions are included under this section of the card. Such other ideas may be more ambiguous or more specific than the original assignment. After the initial outburst of a free-form activity in creativity, teachers or group leaders, in their roles as managers, can elect to focus the group inward on specific subject matter related to the assignment chosen or may work further outward into adjacent areas or unexpected areas that have been found through the initial activity to have an interesting relationship that the group wants to follow. When possible, a democratic, group approach to further directions is recommended.

4. Note space. Room is provided for the leader or members of the group to add new suggestions for further activities. We emphasize the idea of the leader and his or her participants as curriculum makers, and not just as curriculum users. In the early stages

of development, we asked our testing groups to send us ideas for new cards. One of our performance objectives was that after working with the materials for awhile, users should be able to generate their own ideas for activities. Many of the ideas we received from all sorts of people were every bit as good and frequently better than ideas we had included on our published cards.

Since this is intended to be a set of materials that induce creative activity, our primary interest is in the processes of invention rather than in any single completed invention. Re-inventions are equally acceptable. At the outset of the project, we half jokingly thought we might make a last card or last "page" of our materials consist of a blank sheet with a match taped to it. The implication was that when you were ready to light a match to the cards and burn them, then you had progressed to the kind of creative behavior in which you no longer needed the support of gimmicks like ours. You were then probably in a confluent and open learning situation.

5. Side comments. Around the edge of the cards, we included slogans emphasizing the need for openness and humaneness in ES classrooms. We stressed ideas such as trusting, accepting, and caring for students as people, having the teacher be a model of openness, getting rid of comparative or coercive evaluation in the group, and other such ideas. In addition, we included comments about the degree of "riskiness" we thought teachers might have to deal with in choosing the particular assignment. These were to help the teacher go in open-eyed, insofar as our experience could predict, and knowing some things that might go "wrong" or troubles within the school (with other teachers, administrators, and even within the classroom group) that could develop as a result of using the assignments suggested.

Here are examples of card titles and action lines:

EXPECTATIONS	Figure out what kinds of things people expect you to do without asking your permission.
INVENTION BOX	Create a poem, play, art-form, song, pantomine, experiment, _____, _____using what you find in the invention box.
MANIPULATE	Find out which people manipulate other people and which people get manipulated. Determine if the manipulation is fair.
INVIZIMAP	Go outside and map something that you cannot see.
SHOWMEAMILLION	Go outside and find a million of something and prove it.
YOUR THING DO IT!	Go outside and do something that you really want to do.
UPTIGHT	Predict the things that will happen during the day to make you uptight. Keep a record of how good your predictions were. Change the things that happened that you didn't like.
SIMILISOUND	Find and bring back sounds that make you feel: ____ angry ____ sad ____ beautiful ____ afraid ____ happy ____ tough ____ ____
PREDICTPREDICT	Go outside and find a change that is predictable.
ENVIRONART 4	Go outside and collect materials you find in your environment and create some art from them. Have each piece of art show one of the following: ____how ugly your environment is ____how beautiful your environment is ____how it makes you feel ____the joy of your environment ____the sadness of it ____how time changes your environment
FEELING GOOD BAD	Map the places in your environment in which you feel the most and least comfortable.
TIME . . . *TIME AGAIN*	Organize into teams. Each team take a picture of some time during a week-long period. . . . each team should keep the time secret from the other teams . . . each picture should contain a clue as to when it was taken . . . at the end of the week put all the pictures in chronological order.
PREDATOR PREY	Go outside and find who in the community are predators and who are prey.
CAUSE . . . & EFFECT	Go outside and find two things -- one of which is responsible for the other.

The final version of the ES materials also contains some short booklets and games intended to help teachers work outward from the original "stimulator" into various cognitive areas. But basically, the materials must be considered as triggers to the process of invention. Once the habit of using and valuing the ties between cognitive and affective aspects of learning, and the habits of humane, caring interpersonal relationships become parts of the fabric of a group, fruitful learning and growth must be inevitable.

Here is a "curriculum" that isn't really a curriculum at all. We prevented linearity by putting assignments on cards and making each assignment self-sufficient, so that any order could be used. Our plan was that these materials could be used all by themselves or they could be used to help teachers using regular linear patterns and get a sense of how it works to let students try more individual approaches to learning. These clearly provide transitional routes and stimulating ideas that move a group toward more confluent classroom processes.

The technique of using such open-ended assignments can be used in any specific areas of interest as well and at any level. At the University of Massachusetts, John R. Dixon of the engineering faculty created a similar set of assignments, based on the ES model, for use in a beginning course in introduction to engineering. Here are examples of some of his 37 "assignments."

> Visit a local dentist's office and find at least three engineering problems. Describe the problems and, if you wish, analyze them and recommend solutions. Tell the dentist about your results. Share your learning experience with your colleagues if you wish.

> Go out and find and photograph results of engineering work that you feel are good. Also find and photograph some you feel are bad. Share your learning experience with your colleagues if you wish.

In a beginning geology class I tried the following as triggers:

> Go outside and photograph 3 of the most geologic things you can find. (When the group reconvened, other people tried to guess from the polaroid photos what the person taking the picture must have had in mind.)

> Go outside and photograph 3 of the most ungeological things you can find. We agreed to give these photos to a later group of people and to tell them that the photos were taken of the <u>most geological</u> rather than most <u>ungeological</u> things. The later group had no trouble in finding geological significance in the photos that had been taken expressly to be ungeological. We were working with the nature of relationships at the time.

As a device for introducing elements of confluence into workshops of all kinds, we have used ES-card types of assignments and often the cards themselves as a way of illustrating the role of ambuguity, the nature of process learning, and movement in the direction of confluent education. At a number of colleges, even in front of large groups we have gotten up in front, thrown a packet of ES cards out on the floor and said to the group, "Pick a card, do what it says, and come back in a half-hour to talk about it!" Suprisingly, it actually works.

* * * *

Other curriculum groups concerned with movement in directions that support and encourage confluent education have begun to produce similar things. The Human Science Project (HSP) of the Biological Sciences Curriculum Study is now pilot-testing materials for the middle school level. The HSP materials are also in card-type formats similar to those of ES, and, in many respects the materials resemble ES materials. A primary difference, however, is that the HSP cards are specifically designed for use by young students, whereas the ES cards were designed for the teacher to use. Assignments are also somewhat more specific than ES assignments. In general, ES cards are not "meant" to be handed to students for them to work from, although, in practice they are often given to them. Their very attractiveness leads teachers to want to share them and, since the cards lead to values centered around "openness," teachers rarely want to keep the cards concealed as any kind of "hidden agenda." This would be contrary to the very nature of the ES ideas.

HSP cards are displayed in the classroom in a big display-type cabinet, and students in HSP classes may select any of roughly 60 assignments per module on a given day. Generally, one module is available at a time for a period of 2 or 3 months. (Examples of modules are major units such as "Reproduction," "Behavior," "Perception," "Changes," "Ecoself," etc.) The limitation to one module at a time does focus the groups slightly, but on a given day, 30 students may well be working on 30 different assignments. This guarantees great diversity and individualization in HSP classrooms. Many of the assignments are specifically value-related, so that they aim directly at a confluent approach to integration of emotional and cognitive factors.

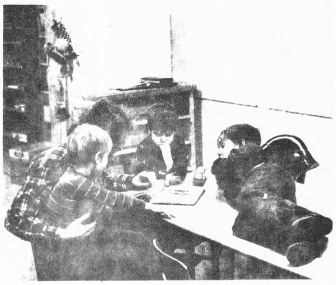
Interestingly, in the test program, many students have expressed a wish that there were more "group" activities, since virtually all work is done by individual students. (Often, however, students form small groups, and some assignments cannot be done individually but require several people to cooperate.) In ES, the opposite problem exists: most of the assignments are intended to be made by a teacher to a group, for group work. I have found that I don't often use the recommended group approach to ES materials since I operate in an environment that is already individualized and confluent. ES students often want to go off on

their own and not work with the group. Each "group activity" does break down into individual approaches, but the group keeps pulling people back to it. When done too individually, ES ideas lose something for lack of the needed group interaction.

Other materials of these types also exist or are in the process of development. The materials of the Individualized Science Instructional System (ISIS) being produced at Florida State University by the group of Ernest Burkman will consist of wide choices, not unlike those of HSP, for high school students. Virtually all other existing curricula lend themselves to individualization of the ES-HSP-ISIS types. Assignments can be recast in terms that invite individual activity and diversity, and then the primary reading and lab materials can serve as a support base rather than as a curriculum to be followed by all. A major problem some teachers find in these approaches is in the lack of sequentiality that some people feel is inherent in each science discipline. I, for one, disagree that things need be presented in such sequential fashion. My experience with materials that "must be treated in sequence" is that any subject can be entered at any interest level, and that "prerequisites" will be picked up as they are needed. I have discussed this idea further in Consciousness and Creativity under "problem-centered" approaches as opposed to "method-centered" approaches, a subject treated in greater detail by Abraham Maslow in The Psychology of Science.

An additional problem I heard several HSP writers worrying about at a recent HSP writing conference was the problem many teachers may have with the kind of new "management system" HSP teachers will have to learn. People using these materials will have to move toward allowing great student self-management. This is as it should be, for the basic intent includes self-management as a primary goal of the programs.

Thus, in a sense, the ES, HSP, and ISIS materials are complementary. ES helps movement toward openness and confluence and provides needed group approaches that help develop community. HSP and ISIS materials work well in an environment that is substantially open and encourages individual, self-directed activity. Together, materials such as these provide a powerful transition in the direction of a confluent environment and toward the open-curriculum school.



"Although science education research is currently pursued with vigor and with increasing sophistication, it has little direct effect on what happens in science teaching classrooms. Something is clearly amiss. I suggest that it is the nature of the science education research itself which is largely at fault. Hence, this research must emphasize certain new directions. One of these is along the lines of more intimate, as well as more holistic, careful studies of science instructional materials and science learning environments. Another important new direction, which we can ill afford to neglect, is a concerted incursion into the affective domain as it relates to learning and teaching science."

--- Leo E. Klopfer

One of the problems of attempting to evaluate what is going on presently in science classrooms is the reductionist, fragmented approaches science educators and evaluators are currently taking toward their work. They claim that the really important questions are too hard to deal with, so they continue to develop more sophisticated approaches to more trivial questions. In the same volume of abstracts as the one in which Klopfer's abstract shines out to me as a highlight, there are seventy-five others, and most of these tell little that we didn't know already and almost none will have any effect on improving the access that science students have to functional learning. Catch some of these titles, "Pictorial Communications Research in Science Education," "Effects of Formative Education and Remediation in Achieving Mastery of Intellectual Skills," "The Ability of Teacher-identified Noncollege-bound High School Biology Students to Identify and Apply Selected Principles of Biology," "Effectiveness of three types of visual devices on the achievement of selected theoretical concepts by elementary children," "An evaluation of the effectiveness of narrative reading materials in science teaching," "Limitation of research in Science Teacher Questioning Behavior," "An Investigation of the Effectiveness of Visuals Differing in Degree of Stimulus Explicitness on Learning for Individuals Differing in Entering Behavior."

My intent in listing these particular titles is not to single out their authors, many of whom I know and value. I just feel, "What a shame that all that energy goes to waste on trivial repetitions." I could just as well have cited the titles of some of my own papers on science education topics. I found it easy to get caught up with the science education research fever. It's a gratifying little merry-go-round where the members of the group feed each others' egos and where we seldom looked out into the real world of students and learning. Mainly we tried to "objectify" what others were doing, rather than moving in to try something dramatically new and to describe it carefully and well, using all of our subjective powers and intuition and including our "subjects" as co-evaluators. The need for careful statistical treatments, the focus on methods of research and on research design has allowed many science educators to avoid stating their real opinions. "If you can't prove it, you shouldn't say it. . . and you certainly shouldn't print it!"

Unwillingness to risk connecting things up to significant problems and to draw parallels that extend beyond the primary scope of a study but rather to "play it safe" is not limited to science education. Reading through the titles of scientific reports in Science magazine is a frightening experience in trivia across the board. But every now and then some delightfully perceptive comments come through. In a letter to the editor, Gamzu, Williams, and Schwartz criticize an article published earlier by Welker, Hansen, Engberg, and Thomas. The critics argue that Welker et al. stepped beyond acceptable limits by talking about "learned laziness" in an experiment where certain pigeons apparently learned that they'd get fed without pecking on their food buttons. Gamzu et al. state that organismic concepts (such as laziness) require much more extended experimental treatment than Welker et al. applied, "if appropriate standards of scientific inference are to be maintained." Gamzu et al. go on to deplore that using the term "learned laziness" was unfortunate. "It is almost an invitation to overextrapolation to social systems by legislators, nonexperts, and indeed by the authors themselves."

Weller et al. respond strongly, "We recognize the danger . . . but acknowledge its opposite, the aloof unwillingness of certain scientists to even consider the practical applications of their work." They feel that "These are times in which scientists should be encouraged to seek appropriate extrapolations of their basic research, rather than being discouraged from doing so."

So be it!

I recommend the letters to the editor and the give and take of technical comments in Science, Nature, and various other scientific journals as one of the best places to feel the pulse of science as a process.

When I was at Syracuse University and later at the University of Colorado I saw numerous science-education graduate students abandon promising and exciting research studies focused on significant problems. They were warned by advisors that they wouldn't be able to draw up a satisfactory statistical design, that the problem was too dirty, too complicated. So they slid back to something safe, clean and TRIVIAL.

At the Earth Science Educational Programs, we did a study of several hundred teachers and students affected by a series of in-service teacher education programs. We concluded, on admittedly tentative statistical grounds and a lot of anecdotal evidence that only the programs that made specific

tempts to help teachers deal with students as
ople made much difference in the classroom.
re are some reviewer's comments that led to
itial rejection of our data by a couple of
jor journals:

> We concur that teacher's attitudes and behavior are often reflected in how the student may or may not progress. But the proof submitted in the article was subjective and selective in the data used.
>
> The paper is not thorough and too frequently relies on subjective considerations to explain the data. The authors search for correlations between their opinions of what constitutes a "good" institute and poorly defined "gain scores" that are based on instruments reflecting their own biases about what is best. . . . The conclusion in several instances can more properly be termed "opinions of the authors" rather than "conclusion of the study."

We dared to ask some difficult questions, use all the resources we could muster, and report both our data and our opinions. agine that, opinions, admitted subjectivity a "scientific" study! And our result was ghly critical of conventional teacher education programs. If we'd come up with "no gnificant difference," a report of data with conclusions, or something that said that the atus quo is ok, the journals would have accepted the paper immediately. As one rejecting feree said, "Is it possible to reduce the ngth of the paper and to treat the interpretion of the limited data as a progress report?"

Yet an article stating that there is no gnificant difference between learning (as asured on a trivial, fact-oriented, subjectter test) of biology in a BSCS class as posed to a "conventional" biology class is most sure to get fifteen pages right away!

Wasted energy and misplaced values! All that human power continuing to be devoted to relevant matters.

As empiricists, program implementers, novators, or "internal change agents" as rren Bennis would label those of us who are voted to the inclusion of humanistic values institutions, we still need information that ll help us develop our programs. Unfortunately, ere is heavy external demand for "objective" mmative evaluation while we are involved in fficult initial stages of development. We ed evaluation that is "formative," simple feedck to build on, not final pronouncements of undness. In any process-oriented activities, ntinuing change is a key factor so it may ver be possible to obtain very useful "final" aluations except on a descriptive, historical, st hoc (after-the-fact) basis. Yes, we can arn from history, but we need immediate, subctive, developmental data. Many of us are sorting more and more to anecdotal data, subctive reports, personal discussions, questionires, our intuition, and the opinions of outders whom we trust. Somehow, outsiders must so be educated about our activities so that they do not pour so much negative and toxic energy into our environments for change that we must divert our energies away from the primary task of maintaining a change-oriented, confluent environment.

Questionnaires have provided at least some numerical data and information that have been useful. We are trying in our own innovative group at St. Lawrence to get information from students at various levels, from our graduates, and from outsiders about how they view us.

The uses of the data from these questionnaires have been many. The most important has been to help programs and the quality of the learning environment and our relationships grow and improve. The second has been intra-departmental communication. Some myths have been laid to rest by the results of the questionnaires. (Others persist anyway.) A third has been cross-campus communication with other departments and with our administrators. Votes of confidence from learners working with us are helpful even when adversaries persist in trying to discredit the data. When we admit failures and problems this helps others accept us more readily for the things we are trying to accomplish. Our credibility and survival are proportional in the long run to our openness and honesty. A final use is in describing our model to the outside world through journals, etc., so that other educators may find support for similar efforts of their own and provide us with their support and interest from outside as well. We get useful feedback and questions from many quarters. But we have to learn not to be disturbed too much by criticism of our attempts.

Ultimately these attempts to describe as openly as possible what we are doing are our answer to the accountability demands of our institution, parents, colleagues, and learners. The more information we can provide, the more accountable we are being. Because we are operating in a very different mode from many other groups, we are faced with the problem of inventing new ways of communicating about how we operate and what our results are. Our success or lack of it in the long run will be seen as a matter of historical perspective and cannot really be judged until ten, fifteen, perhaps twenty years from now. In the meanwhile information may reassure the outside, help the inside to respond and grow, and can help stimulate others to try both our new directions or others of their own.

Some of our faculty colleagues, sarcastically amused at our questionnaire results and newsletters, created and disseminated their own anti-information newsletter which came at us as the following widely distributed parody.

Department of Lunar Studies Newsletter:

> The results of bold, imaginative programming have been quite gratifying. Students engaged in sponsored projects of self-observation responded to a recent questionnaire with candid enthusiasm. Over eighty percent felt that they had

gotten to know themselves better during the fall term; the majority of these pointed to the reason that they had been living with themselves for a longer period of time by the semester's end. A tiny minority reported that prolonged self-inspection produced only tedium or a species of intellectual claustrophobia, but the department notes that most of these individuals were upperclassmen who had probably become overly dependent on books or laboratory equipment prior to the experiment.

* * *

Whew! Score One!

GRADING: SOME PRACTICAL CONSIDERATIONS

I still work in a system that is hung up on grades. Grades are one of the dominant subjects of conversation among both students and teachers in my university, and I can't remember many places I've visited in several years of extensive visitation to other schools, elementary, secondary, and college, where the subject didn't come up. Grades become the ultimate seat of teacher power. Without grades and credit teachers lose all true power over students. By abolishing them I may take the biggest single step towards creating a confluent learning environment - one based on trust and mutual respect. One in which intrinsically motivated, functional learning may have the best chance of flourishing.

During my own school days I was not unduly affected by grades. Although I was frequently bored during school hours, these took up only a small portion of my day. I got on the "good-boy" list, and, therefore, even when I had a bad day, teachers simply chalked it up to "bad day" because they knew I usually did better. I talked a lot about the "Pygmalion" effect in Risk-Trust-Love. If you have high expectations of a person, he will usually do well. I always knew I'd make it.

But A's are limited to ten or fifteen percent of the people in school. Remember the old gaussian distribution curve. In a "normal" population, only a small percentage of the people are supposed to do well!

When I got into teaching I was jolted to find out how some people were affected by grades. I used to sweat and be nervous, and hate tests, but I was seldom disappointed when the papers came back. And I didn't even think about how the people on the other end of the scale must feel. That's the trouble with a lot of us in teaching. We made it. How about the ones who didn't??

I began to realize that when I recorded a judgement in the form of a grade to be placed on a transcript I was encouraging people who would look at that transcript in the future to accept my judgement of the past rather than looking at the person actually standing in front of them several years later! I personally don't care to be prejudiced by a person's past performance. When I meet another person, I want for us both to be new people exploring each other from the ground zero of no real knowledge of each other. There is incredible uniqueness in each person. There is no overall "normality," except as a statistical concept. People are too multi-dimensional for that. A person high on a curve for one trait will be lower on a curve for another. Once self-confidence gets going, you can even begin to show up as being good in areas where people once said you were hopeless. So I refuse to start from averages or to dwell on inadequacies, correction, remediation. I am interested in finding strength and working with this strength. Once positive feelings begin to flow from a base of strength and confidence, then a learner may be able to start taking more risks and moving into areas that were previously avoided from fear of failure.

Regardless of philosophizing about positive and negative aspects of grades, and regardless of the "liberated" view you or I may hold with respect to how tests can be used to help growth, (see my earlier chapter, "Testing, Testing, Testing ...") most of us will continue for some years to have to deal with the recording of grades. Perhaps an account of how I have dealt with details of this problem may provide ideas that others may find useful.

When I first moved to St. Lawrence University and when I worked in the UPSTEP program at the University of Colorado I told my superiors that I wanted all work in my program to be on a simple "credit" basis: either enough work was completed for us to record "credit," or else the student still needed to do more work.

> I would have preferred no kind of transcript at all, but our people in both situations were only taking part of their work with us and then there was a discontinuity between our programs that made it desirable to have some kind of translation possible onto the learners' transcripts. We could have elected to spend energy trying to change the system, but we have realized that energy expended in this direction is generally wasted. Trying to change the overall system through channels is a little like boxing with a blob of jello. You hit it, you make what appears to be a dent, then you turn around for a moment and it springs back to right where it was before! So we've elected to change our own way of operating within the system by "redefining" factors that we consider to be inhibiting.

In asking to have a simple "credit" system applied to us we expressed our view that there is no such thing as unsatisfactory performance. "Unsatisfactory" in a learning situation simply means that you haven't learned it yet. That's not "unsatisfactory" or "failure," it's just incomplete. There is no such thing as real completeness. There is no "perfection." It could always be better. No need to record incompletion. Only "completion." But since completion is also a relative thing, who decides it's even "complete?" I know that I cannot judge the dimensions of another person's experience. I cannot know where the person has really come from and where he or she is really going. We become partners over a short segment of a much larger excursion. A seemingly trivial outcome from my point of view may have great experiential importance in a

learner. What is important is the learner's growth, not my judgement of it.

With that attitude, all that is left for me to say is that the work is "complete" for purposes of recording it on a transcript when the learner says it is complete. I can talk it over with the learner. I can try to learn what I can about him or her experience. I can try to share my ideas. I can give my opinions, just as the other person can give his or her opinion about me and my state of "completion." One of the reasons I like to learn as much about what people feel they have learned is my own interest in the learning process itself, the process of creation, and the nature of perception. As others share their experiences with me, my experience in these areas is enriched and I grow. As I grow I facilitate learning more effectively for people I work with later. Thus it all begins to fit together as a matter of mutual advantage and growth.

But at both the University of Colorado and at St. Lawrence University they have strict rules that govern the number of courses a student may take under the "pass-fail" option. Neither institution even has a credit-incomplete option. (We explored the matter in the Council of Department Chairmen and The Faculty Council at St. Lawrence last year, but it was voted down by large majorities in both.)

As a sidelight, it's interesting to me that many faculty and students say "But the students (we) want grades!" In the first place, my experience with learners indicates that the statement is a vast oversimplification. What it really means is one or a combination of the following:

> The students who are already getting the A's want to stay one-up over those not getting the A's. They have succeeded in the competition and want to stay on top.
>
> Even those who aren't getting spectacular grades fear that a change in recording systems will hinder them in the competition for entry into the next higher school or in getting a job. (This is generally fallacious reasoning as far as the most desirable schools and jobs are concerned, but faculty members love to use it as a way of getting the students to support faculty unwillingness to change.)
>
> The students are so conditioned to receiving outside reinforcement that they feel insecure in their own ability to work without being forced to.

The recording scheme I hoped for was voted down, so that I had two alternatives. The first was to keep on grading people as I had always done before. ("I can't stop giving grades because they won't let me.") On the other hand, I could redefine the situation in my own terms to create a satisfactory interface with the existing system - a new system within-the-system that would not penalize the students but would also remove the inhibitor that I saw teacher-assigned grades as being.

I took the latter course of action and announced that all learners working with me would grade themselves. I would sign the grade cards and not make any changes. I insisted on communication between us before I would sign the card indicating grade and credit, but I would not use power to force a change. My faculty colleagues in the department agreed to do the same to start with. We did this openly and announced the reason for it. Our whole approach to an open learning environment was based upon the removal of learning inhibitors, and we agreed at first that teacher-imposed grades were significant inhibitors. The academic policy committee passed a motion allowing us to do this with the proviso that we could not give up "responsibility" for these grades. At the University of Colorado, we didn't bother to get permission to allow self-grading. We just did it.

For five years now I've been working on basically a self-grading scheme. In general, people give themselves high grades. That's good. I'd like it ultimately if every learner had the confidence in himself and the satisfaction in his work to give himself the highest marks possible while still being open to continuing growth and richer, fuller awareness of experience and acceptance of life and change.

At first, learners wouldn't believe us. When they came in at the end of the term, one by one, many wanted me to tell them what they should give themselves. The old dependency game. Many said that they had no basis for comparing what they did with the work other learners were doing. In two or three cases over the last three years learners refused to grade themselves. For these I have sent in an "incomplete" since one of the terms of the experience was each learner's responsibility to deal with his own evaluation. With some learners the final interview has been a kind of coy dance. It's a phoney game I haven't liked. Over two-thirds of people who have responded to our questionnaires have said they would prefer a different grading system - preferably of the pass-fail or credit-no entry type, just what we asked for in the first place.

The Dean and some of the faculty worry about "quality" and "excellence." What do you do with a department in which perhaps sixty percent of the beginning students get A's? They have tried in various ways to pressure us to change. Several of our own departmental faculty have retreated to a modified position using contracts of various kinds with learners and even graded tests. This is still a faculty-controlled accountability system which I feel inhibits free exploration. It's a little like having a professional scientist starting a research project and trying to follow his plan exactly! That's not very good science. In basic research many of the more creative scientists move in the direction in which their results lead them. These directions are often highly unpredictable. The same holds for learning. What is important, in my view, is to follow the direction of greatest interest. That's what I have against contracts. They limit, and the focus they demand may inhibit maximum functional learning and growth. They certainly encourage a

variety of scholarship that I do not particularly value.

The other extreme is dilletantism, in the eyes of some people. If you jump around too much with no focus, you'll never really learn anything, they say. I question that premise.

Another thing some people worry about is uninvolvement. How about the student who does nothing and still comes in to demand his "A"? I always grant it, and in many instances the very fact of dealing with lack of honesty with self, with feelings of self, with problems of "I have to get an A in this or I'll flunk out," or "This will make my parents feel good" becomes in itself a far more important personal growth experience than any amount of geology at that time of that person's life. Incidentally, there are few people - probably fewer than ten percent, who are really uninvolved but who ask for such high marks. Letting these people have the high mark may be one of the most important stimuli to the taking of personal responsibility that the person can experience. You have full permission to "cheat" because there's only one person you can really cheat in the long run - yourself.

Many learners coming in for their final interviews had a real sense of incompleteness, of I-haven't-finished-what-I-wanted-to-to. For these people we first of all agreed to turn in a rating of "incomplete." In our very first semester of self-evaluation twenty-five percent of the incompletes for the whole university came out of our department, and all were self-assigned! To me this shows a great deal of honesty or at least of mature rejection of earlier lack of involvement. It said that these people wanted to do additional work before claiming credit. When the Dean saw the records and word got out to the rest of the faculty you should have seen the fur fly! "Failure to complete required work during the term is failure and should be recorded permanently so everyone can know later that these people goofed off." Besides that, according to the official definition of "incomplete" we were misusing the rating, which was supposed to be reserved to cases of illness and other severe problems. Several of us refused to recognize term boundaries as having anything to do with learning and we pointed out our intent to keep on declining to claim completion before the learners were ready. If they wanted, we'd be glad just to hold the grade cards. "What would the computer do with gaps?" So we adopted an obscure rating that had been used by our music department. Ken Munson had begun using a non-grade called "X" which meant "work in progress." On the computer printouts it shows up as "continuing grade." Technically it's supposed to be agreed upon in advance and to relate to project work that requires extra time because of the very nature of the work. This rating has now been elevated to a position where it is widely accepted, and many of our people still claim this at the end of any given term. The system accepted this new rating because we said it was essential and that in one way or another we would allow work to transcend semester boundaries, which, to us are strictly mechanically set-up check points and have no relationship to learning activities, no matter what kind of term scheme exists.

Some students are now spreading what used to be a one-term effort over two or three terms. Others are completing a "term's" work (whatever that means) in a week or two of intense activity. Many people are feeling comfortable about having done what they really wanted to do by the time they claim credit.

One of the people I worked with at the University of Colorado claimed that our open approach "wasn't working," because many learners didn't really begin to get to work seriously until the term was two-thirds or three-quarters over. "Then they can't possibly finish their work by the end of the term." This senior faculty member still accepted that term boundaries have meaning. One thing I will say for the C. U. group, however, is that they had rejected the idea of failing grades, and the grade "incomplete" was widely and generally used to indicate work-in-progress. Completion there is still determined by faculty members rather than learners, but at least they have begun to feel a greater sense of independence from arbitrary and meaningless time constraints.

I still found myself very dissatisfied with what I have already referred to as the "coy dance" of the self-grading game. It got less annoying as learners came to realize that we really did attribute low significance to letter grades or numbers that discriminated between one learner and another. Our dialogues became more honest and more direct, and I think, students began to feel that they didn't have to please us. Yet, every new person dealing with this situation still felt the same old fear, "Is he really going to unsheath that naked power we know he has under that velvet glove?"

On other occasions I have "given" everyone in groups a blanket "A" and announced this on the first day of class. John Emerson tried that with a group of science learners at a Missouri college and said he was amazed to find that everyone turned in a performance that he felt worth any person's "A." I'd heard of lots of people assigning blanket B's, and I'd even done that myself on a graduate geology seminar at Syracuse University one year. But the blanket B idea seemed to me a cop-out. That was playing it safe so the Dean and the rest of the faculty would look at departmental records and grade-point averages and see that we were "normal" and therefore maintaining "appropriate" standards of excellence. I wanted them to sit up and take notice that we were excellent across the board, that the gaussian curve was irrelevant. I insisted that all people come to see me at the end of the term as usual, and I had good information about what each person was doing at the end of the term. Some people I knew to be doing work which from my viewpoint looked very good. Others shared less of their experience with me. A few insisted that they did not wish to have the A submitted, but preferred a lesser mark or an "X". I deferred to their wishes. These last

interviews lasted a full week. We had a sort of round-robin, continuous seminar involving anywhere from two to seven or eight people. We talked about all sorts of interests, and I felt good about the easy feeling of sharing I experienced with them. The coy grading game was finished: we were able to come closer to honest dialogue than I have felt yet. There is still a long road to go, but we seem to have transcended one more inhibitor.

Effectively, by going to blanket "A" grades, we pushed our administration, just as Dwight Allen did his, to give us what we asked for in the first place: an alternative system for an alternative program. There are infinite ways in which we can disrupt and hang up the existing system. And I will do this in order to remove what I perceive to be significant obstacles to the kind of learning relationship I want to set up between myself and learners who come to work in my company.

In earlier times when I worried about problems of grading and evaluation, I found myself spending a great deal of time talking about this with other people. We spent large amounts of time on this in various group meetings, too. Now I feel that time spent worrying about the issue is largely wasted energy. Thus I'm now inclined to remove inhibitors I see related to grade problems and not to talk about it. When I decided to give a blanket A to my two beginning geology groups last term, I didn't spend weeks discussing with the group whether or not we should do it, what effects it could have, etc. Cricket came home from high school last spring and announced that in one of her classes they had spent six weeks just talking about the grading system. She became so tired of actionless dialogue that she felt they should go ahead and do whatever they pleased. She was tired of wasting time talking about it. I agree with her. Talking about grading systems for weeks on end does little to help growth and learning. I think the same is true about other people, too. If I'm really not much concerned about grades, they simply won't be an issue. When someone comes in to me and initiates a discussion on the subject, I won't try to turn him off, but I won't reinforce continuation of the conversation through a display of interest in the subject.

After writing that last group of sentences I realized that I've just set down a long string of paragraphs on a subject I claim to be bored with! As I look at it from the peace of my den I am vaguely amused at my own continuing preoccupation with trivia. I think I am growing away from this preoccupation, however, and that I am becoming more accepting of what people choose to share with me and I am becoming less judgemental and more open to a wider range of experience than I have ever been in the past. At least in the sense of having any desire to record a judgement.

When we first moved away from conventional grading systems, we recognized that people both inside our group and outside of it would want to see at least some evidence of what our people were accomplishing. The phrase "Yeah, man, we're really growin' in here" didn't seem fully satisfactory to anyone. We set up a scheme whereby each person would keep a personal portfolio of his or her work. It was my intention that this portfolio would be under sole control of each individual. The only person who could add or remove anything was the portfolio's owner. I encouraged people to put things from all areas of their interest - not just geological things - poems, drawings, reminiscences, anything they wanted to put forth in a place where any visitor or member of our group could go see it.

The university administration looked at this idea with relief, feeling that here would be at least some point of accountability. Comparisons with other departments would be difficult or even comparisons of people within our group. And the administration is still terribly worried about who's first and who's second. It's the old American competitive ethic, I guess, - another of the truly significant inhibitors of learning (at both student and professional levels) that we presently face.

I suggested at first that the portfolios be used as a basis for admitting people to our group to work. The idea was, we'll take anyone in for a semester. If that person shows ability to profit from our environment and to use it to what we consider to be his or her advantage and to some vague idea of "credit to the department," then the person could continue to work with us. Thus we tried to develop an easy way of selecting the performers and of rejecting the uninvolved, regardless of what letter-grades appeared on the transcript. We made sure to announce that anyone not admitted need only come to us again at any time when he or she had more to show and we'd be glad to reconsider the matter. All we wanted was to be sure of willingness to contribute to the group in some positive way.

A portfolio review committee was set up to evaluate portfolios of people wanting to become majors. The committee had joint faculty-undergraduate representation, with the majors electing their own members, who, at most meetings, formed the voting majority. To my distress, I saw the student members and a couple of faculty members actually applying publish-or-perish criteria to the portfolios. At first, the people whose portfolios were being evaluated were virtually excluded from the meeting. The committee seemed afraid to discuss people's work truly openly with them. I left some of the meetings with bad feelings about the very nature of the process. It seemed to me that the portfolio concept had turned into one more big learning inhibitor. We seemed determined to continue to reward the conventional and to penalize the unconventional, to select the explicit and to reject the tacit.

I began to plead for looking at the portfolio more as a metaphorical concept. I wanted the portfolio somehow to be considered as a reflection of the whole person. I wanted it to be a device for communication rather than a tool for extrinsic evaluation. As an evaluation device, the portfolio was much like the grade, and a number of our people expressed this feeling to me strongly.

Another problem of the portfolio was that it could not give testimony of all of the tacit learning going on in the person. That's in the very nature of tacit learning: You can't put your finger on it until it comes out, perhaps years later, in a functional situation. Yet it is undeniably there. This means that the whole person cannot be reflected in any accurate way by what he can put between the covers of a manila folder. Just as bad, even some fairly concrete production may not really show up in a form that someone would want to display it. I wouldn't for the world put the hand-written draft of the manuscript of this book into my portfolio. And yet the process of conceiving it and writing it has been in progress in one form or another for no less than two years. How do I show this. Do I just put in a note saying, I'm writing a book? The committee would look at it one semester (no apparent production), two semesters (still nothing in the portfolio), . . . three semesters ("Hey, tell us about that book of yours"), . . . and then "Gee, we haven't room in our community for non-producers like you!" Some of the finest and most careful scientists just might not make it in our portfolio system! Through this approach do we perhaps encourage mediocrity and hasty production rather than well-considered overall growth? These are serious risks. Sometimes the fat, well-stocked portfolio reflects little real growth and development of a learner or of a scientist. Likewise the empty folder may reflect a period of intense internal activity and of gestation. The reverse can be true, too, but real care is required before even simple judgements can be made. How can the way we treat the portfolios make it a growth facilitator rather than a growth inhibitor, another obstacle to be climbed or avioded?

For a while, we stood at a kind of impasse where the committee was denying major's status even to some students whom at least one faculty member expressed willingness to work with. Russ even resigned from the committee once because of such an incident. So did Bill. We worked that one over and developed a new approach in which any faculty member could, on his own authority, become the advocate for a prospective major and could cause the person to be admitted on special status. The "special status" bothers me because it still deals a potential blow out to the self-image of the person to be admitted under that category. He comes in feeling less able than others and he is thus likely to perform poorly and to feel lack of support.

I know what I'd do if I were all by myself in this. I'd listen to my insides and

to the whole person coming to me as much as I could. (That's what I am doing these days in admitting "special" majors). I realize that I couldn't in any way really know if I wanted to work with the person before trying it. So I try. If we work well together and feel that continued collaboration is to mutual advantage, ok. If not, ok too.

I'm not satisfied with what I just wrote. But perhaps it helps to show the process I continue to be involved in: seeking to eliminate inhibitive aspects of the learning environment and seeking to get closer to whole people instead of to any kind of index or record of past performance.

The desire to innovate in the direction of more confluent learning environments came to me basically out of the development of close personal relationships with people and the perception that people seem to learn and function well when they are encouraged to be themselves, to integrate emotion and cognition, and to make their own decisions. I believe this is true for many people who have started to work actively to change school environments. When a desire to change is solidly based on well understood emotions, a strong belief system, and an aware value posture, then it is possible to make a sound, rational, intellectual decision to act, to try new kinds of relationships, and the devil-take-the-hindmost! The action derives from an organismic and consuming need for new conditions.

It's easiest to innovate in these directions if you can move directly into a school, college, or other institution where people mainly share the same set of values about personal responsibility, freedom, democracy, the locus of decision making, trust in the group process, and in individual self governance and self regulation. Unfortunately, few places like that exist in public or better established private institutions. Lots of small, mainly ephemeral private groups work in that way. Lists of these are available through clearing houses like the New Schools Exchange. An open-school movement in which confluent education is widely practiced, is active. These smaller, ephemeral open schools are often short-lived, their average life-expectancy being on the order of eighteen months.

Some public schools and university campus schools encourage experimentation in the direction of confluent learning environments. Among these, the public elementary schools in North Dakota have moved far in a direction of implementing environments similar to those of the British Infant Schools. From the science viewpoint, people like David Hawkins of The University of Colorado, former director of The Elementary Science Study (ESS), have done much to help prepare facilitators and teachers to create, develop, and implement relatively confluent student-centered educational possibilities. Our group at ESTPP seems to have produced some activists, too. Thus far I have been disappointed by the science areas and approaches I have seen in *open-space* types of elementary schools I have visited. They have been teacher-centered and learners have not been allowed ready and free access to various parts of the learning environment. Emotions are still treated as something to avoid rather than to acknowledge and integrate. Even in open-curriculum schools such as the Wilson Campus School at Mankato (Minnesota) State College, the environment for learning science seemed to me relatively weak area. The problem may be mainly in my sampling rather than in the real absence of confluent programs in science.

It is possible to move into school situations where the system as such invites you to work toward the development of a free-access, confluent science program. But it's not a good idea to count on this. Most teachers beginning in a system for the first time will contend with a basically teacher-centered ethic on the part of most of their colleagues. Emphasis will be on control, management, and accountability. For the non-tenured teacher, the problem of survival for the first three years is real. Many new teachers choose to move quietly and within the framework of the system during these early years. They still can work to develop personal relationships that lead to confluence, but they choose to allow an image of the "well-controlled classroom" to be seen by their colleagues and administrators. When their doors are closed, some good things can happen. Herb Kohl's book, *The Open Classroom* has some good suggestions for moving toward confluent education in any area. The Environmental Studies Materials (ES) described earlier in this book provide already legitimized access roads to at least some confluent, student-centered activities. Effectiveness in helping people learn is more a function of the nature of human relationships than in the presence or absence of extrinsically based (teacher-or-school-derived) structure. But the establishing of appropriate human relationships is, I believe, facilitated if the *control ethic* can be put aside to the greatest extent possible.

For the self-confident, tenured teacher, dramatically rapid movement in the direction of confluent education is easier. Some of the fastest changes I have seen have been in science teachers who have been in the system for three or more years and have built within themselves the appropriate emotional underpinnings and convictions that enable them to take substantial personal risks in implementing confluent education. These people have already shown that they can survive in the system and work within it. They face somewhat lower risks in terms of possible loss of job and similar survival factors.

Such teachers simply turn the responsibility over to their students, take a deep breath, and say, "Go!" Then, rather than worrying about past mistakes and possible future problems and repercussions, they deal with everyday situations on a day-to-day basis. Their focus on *now* allows them maximum energy to build the physical environment and to work as effective counsellors with the learners assigned to them.

Science people of this type who have moved out on their own have included people like Roger Hudiburg, whose work I described at some length in *Risk- Trust-Love*. For Roger and others like him, the science "classroom" becomes an island of confluent praxis, a special and different learning environment in a sea of management-oriented training, aimed at extrinsically dictated goals. Roger didn't ask for permission. Neither did Larry Crowley, Ed Maruna, Bob Brown, Jeanne Beecher, El Sayre, Ed Shay, Bill Elberty, Ken Munson, Gunner, Buck,

Bill Fox, and a host of others. They simply implemented what they felt they must do within their own smaller environments and under the protection of that great supporter of innovation: the concept of academic freedom. One of the first things that happened to all of these people, and to me as well, was that their learning environment ceased being confined to science or some rigidly defined discipline. As soon as you move into confluent modes the disciplinary boundaries cease to exist. Learners don't know about the limits of disciplines yet, and so they approach their learning from a fresh viewpoint of *seeking* connections rather than being asked to conform to someone else's ideas of connections.

I have seen small groups of teachers interested in this mode of education and learning come together to exchange ideas and to build routes to cross-disciplinary movement and involvement. This is the beginning of the most solidly based confluent learning environment - the kind that begins from inside, spontaneously, and grows as a viable alternative within the system, constantly cultivated by learners and facilitators who value it. It doesn't require administrative permission, votes, justification. It grows on its own in the hands of an active and involved school community.

In a review of *Risk-Trust-Love*, Hans Andersen worried about budgetary problems associated with innovation, and especially with open education and its need for multiple resources. Budgets are *not* a major problem. Everybody could always use more money. An open and confluent environment for learning science is open to the extent that its doors are open to the outside world and its cabinet doors are open so that full access to all materials it contains is provided. A lab with a million dollars worth of equipment in it and only one cabinet door open, providing access to one required lab exercise for the day is an impoverished learning environment. An empty room without tables, chairs, blackboards, water, gas, etc. but with me in it and its doors open as access routes to *any* out-of-doors (be it urban, rural, or anything in between) is potentially an infinitely rich environment for learning science or other "subjects." A single locked door or cabinet becomes a limiting factor.

When I enter an environment and try to develop it, I can choose to use the budget I have to create diversity. As long as the creation of greater diversity of resources is a primary focus the environment will continue to get richer. Turning the community into a part of the school can ultimately *reduce* school taxes and in-plant costs while increasing the potential power of the educational *system*.

In his book, *Inequality: A Reassessment of The Effect of Family and Schooling In America*, Christopher Jencks and his colleagues from Harvard's Center for Educational Policy Research conclude that increased spending, among other things has done little to correct inequalities in cognitive skills among learners. Many of the most important factors in learning and in-school success seem to be beyond the school. They include genetics, environment, family background, and television. School budget, educational policies, and teacher characteristics in the normal school setting seem to have only minor effects.

To me, this means that the lack of integration of learning opportunities across all of our institutions - family, church, school, nation is what we have to deal with. If we view the world as the school and vice versa, then we can forget about problems such as, "I can't innovate because I can't get the money for it." The things I have tried to express in this book are really independent of budget, although I too spend much of my time trying to get more money. Human relationships and free access to the world at large are the primary factors to deal with. Beyond that, any money to build a better in-house resource center is not only welcome, but will also help learners in material ways to learn more easily. In science, there is a need to weld together the research establishment and the learning enterprise. Both could profit from their integration as both are hurt by their separation.

No, Hans, budgets won't stop us and incidentally, I know that they don't really stop *you* either!

At the St. Paul Open School, parents, teachers, and children established a program in which people:

1. Approach learning with confidence and joy.
2. See themselves as worthwhile persons.
3. Are basically comfortable but at the same time are committed to respond honestly to others actions.
4. Have an active positive regard for every person as an individual.
5. Develop an understanding of human social systems and physical environments.
6. Develop and reassess personal values by involvement with diverse value systems.
7. Develop social skills including conciliation, persuasion, honest communication and group decision-making.
8. Develop basic skills including reading, writing, speaking, computation and learning.
9. Develop good health habits, physical fitness and recreational skills.
10. Develop willingness to take risks, participate actively even in the face of uncertainty, develop commitments and become involved.
11. Think through and deal with the possible consequences of their personal decisions and actions.
12. Develop a sense of awe and wonder; a capacity for esthetic appreciation and enjoyment.
13. Are creative, curious, open to new experiences.
14. Believe their individual actions can influence the course of events.
15. Practice and develop the ability to critically evaluate information received for use in decision-making.
16. Recognize the humor and incongruity that is a part of the human experience.

The 16 points listed on page 116 and the facts given below were compiled by people from the St. Paul Open School to describe their goals and the beginning of their new program.

ST. PAUL OPEN SCHOOL
1885 University Avenue
St. Paul, Minnesota 55104

OPEN SCHOOL FACTS AT MID YEAR

FACT... There were only two months to prepare for the opening of school. Some were convinced it was impossible... here's how it went.

July 6: School Board gave final approval to the Open School for St. Paul.

July 20: Dr. Wayne Jennings was approved by the School Board to be hired as the school's principal and in the next two weeks disengaged from the two school system projects he had been working on.

August 2nd to mid-August: Dr. Jennings and various members of Alternatives, Inc. interviewed over 100 applicants to fill 19 staff positions.

An enrollment committee was appointed and began the job of enrolling 500 students from over 800 applications.

Alternatives volunteer committee sought donations of time and material from everyone and anyone with something to offer.

The clerical staff was employed and began ordering materials and equipment.

August 23: the staff met for the first time for a full week of all-day workshops to develop goals and make plans.

August 31: the building lease was signed and approved by the School Board.

6:30 p.m., August 31: the first contingent of volunteers entered the building to begin their 1-week task of renovation.

September 8: School opened, but not at 1885 University. The school architects announced it was not ready, so 500 patient students spent the first three days of school on field trips and in empty classrooms at other schools.

September 13: first day of school at 1885 University

FACT . . . Volunteers gave 3,000 hours to building renovation.

FACT . . . Staff meets to develop goals and plans to implement them.

FACT . . . Volunteers continue to give many hours daily.

FACT . . . College and University students became involved early.

FACT . . . Advisory Council offers new kind of involvement for people.

FACT . . . Mini-charettes were held to further develop learning centers.

FACT . . . Regular bulletins keep parents informed.

FACT . . . Speakers bring the Open School story to others.

FACT . . . The Open School has received 844 column inches of newspaper coverage (the equivalent of 5 full pages).

FACT . . . 2500 people have visited the school since September 13th.

FACT . . . 85 letters of inquiry have come to the school . . .

FACT . . . A waiting list of 300 remains.

FACT . . . The budget for 1971-1972 was $835,000.

FACT . . . The Open School is highly significant educationally.

If you're lucky you can sometimes move in on a large scale and set up this kind of special environment from scratch. Don Glines had this chance at the Wilson Campus School. He describes this in detail in his book *Creating Humane Schools*. He marched in one September morning, as new director of the school, and said, "This is the way it's going to be!" Thus an authority-based decision became the basis for an outstanding new experiment in education. Vito Perrone did the same thing when he set up the New School for Behavioral Studies of the University of North Dakota. Dwight Allen did it with the School of Education at the University of Massachusetts at Amherst. Wayne Jennings, with the powerful support of a parent-based group, is doing it at St. Paul. Eric Clausen did it for four years in the Experimental College at Minot State College. Bill Elberty and I have, over four years, been able to institute a confluent alternative program in geology and geography at St. Lawrence University. All of us were lucky to be able to move in from a power base and thus to avoid a great deal of harassment. Mind you - I don't mean to imply that we haven't been harassed - but we will have at least survived for a period of years.

In the very fact of survival, even for a relatively short number of years in some instances, large-scale innovators make it easier for other people to try things on a lesser scale that may be comfortable to them. When the focus is on the "outrageous" things a few people are doing, others can try all sorts of things, many of which lead to improvements of the overall learning environment.

When innovative programs "go under" in an institutional context, even if the larger institution *does* reject the extremes represented, the institution as a whole is often left richer in alternatives than it was before.

As Bill Coulson suggests in *A Sense of Community*, the very process of becoming institutionalized may, by definition, kill community, confluence, and openness in the long run. Thus, the disappearance of a confluent learning *community* is not necessarily to be deplored, but rather to be celebrated perhaps. For many individuals from a given community will branch out and start new and different communities, each with a time of birth, growth, and disappearance. Community resides within groups of people. It is an organic concept. Groups of people change. Thus a fixed institutional framework and a long-term confluent learning community may not be compatible. Warren Bennis traces the evolution of organic organizations in some of his writings.

Nontheless it may be possible to generate overall institutional structures that respond rather than control. This is what we must hope for. Perhaps what we need is the de-schooled society of Ivan Illich, John Holt, and Paul Goodman. In such contexts institutions are viewed by everyone as ephemeral and temporary. Flexible, and changing groupings replace the stable, fixed, rigid, and confining configurations of today's school systems, universities, and even governmental structures. If, in education, we are ultimately interested in the growth of individuals in the direction of their incredible potential, we must work in the direction of infinitely flexible learning environments. "Science" and its practitioners, supporters, and beneficiaries can only benefit from such an approach.

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On Dwight Allen: Some may protest that Allen ran into a lot of trouble recently, as discussed in D. Robinson, "One View of the UMass Mess," *Phi Delta Kappan*, v.56, 1975,p.532. Even though accounting problems came up in that situation, the innovations introduced at the University of Massachusetts have been of extraordinary significance from an educational point of view. The fact that one or two of Allen's associates misdirected some funds (and even this accusation may be a political ploy) does not detract from the importance of the experiment and the long-range effects it may have on American education.
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